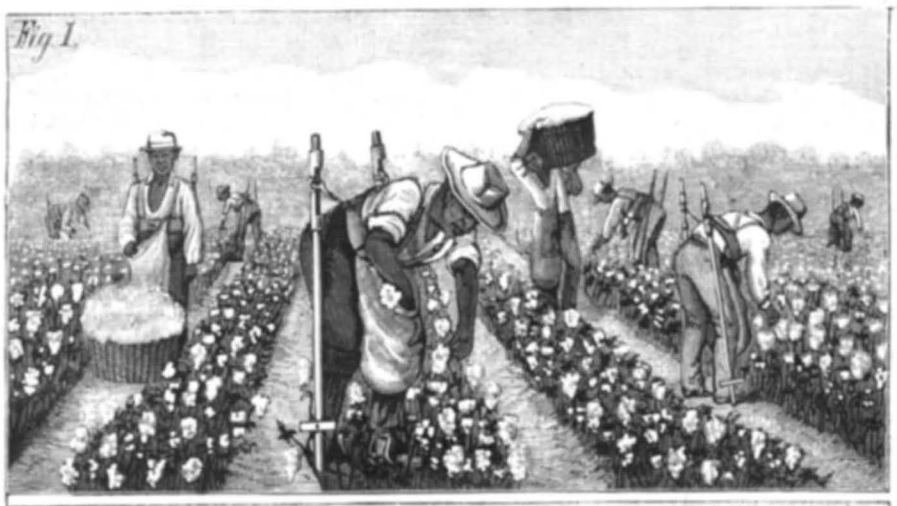
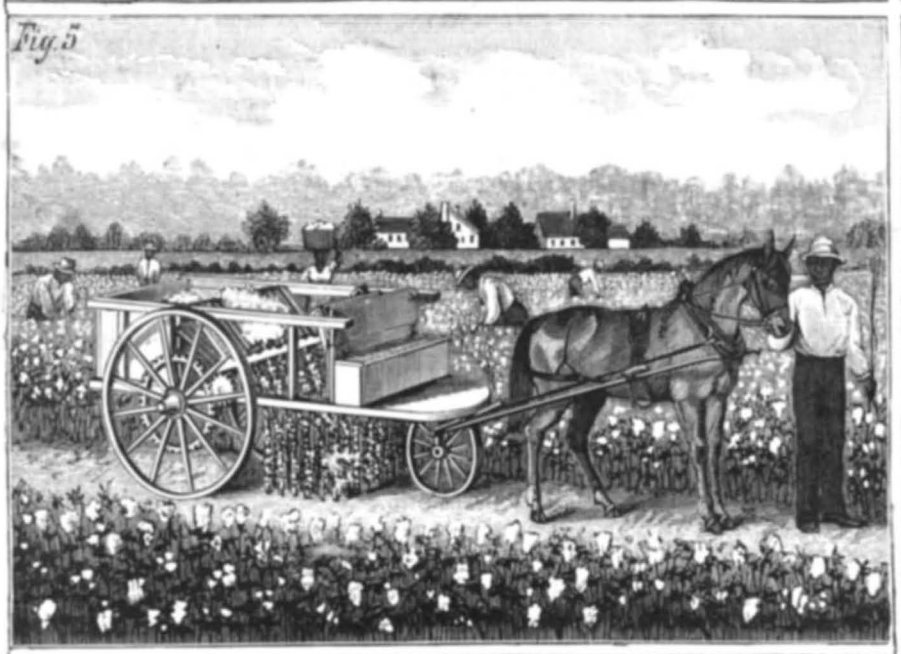
SCIENTIFIC AMERICAN

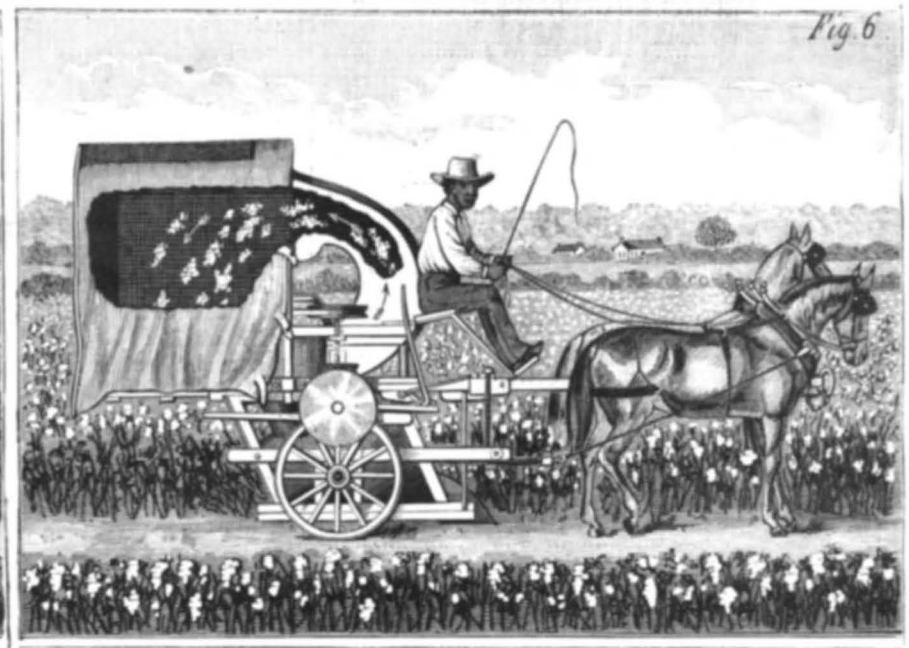
[Entered at the Post Office of New York. N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION. ART. SCIENCE. MECHANICS. CHEMISTRY AND MANUFACTURES.

Vol. XLV.—No. 14. [NEW SERIES.] NEW YORK, OCTOBER 1, 1881. [$3.20 per Annum. [POSTAGE PREPAID.]







MACHINES AND APPLIANCES FOR HARVESTING COTTON.

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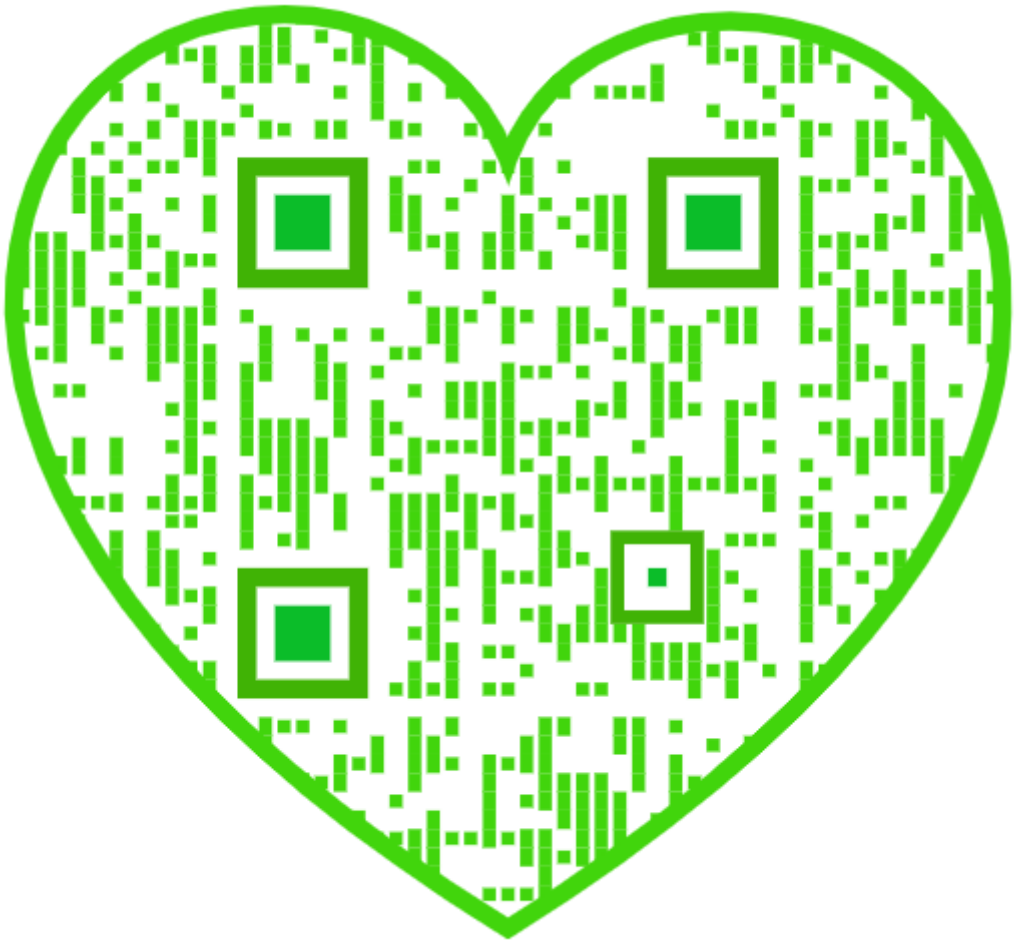

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, OCTOBER 1, 1881.

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FIELD AND FOREST FIRES.

During the fire week of September a large part of two counties and a portion of adjoining counties in the triangle between Saganaw Bay and Lake Huron, in the eastern part of Michigan, were swept by fire, destroying not only the remaining forest, but many small villages and a large number of the outlying houses and barns of the settlers. In the newer districts everything was destroyed and many lives were lost. Much of the country had but recently been cleared, and everywhere there were large areas covered with brush and other food for fire, thoroughly dried by the long-continued drought. For two months there had been little or no rain, and as usual small fires were burning almost everywhere. On Monday, September 5, a high wind arose, and for several subsequent days everything was aflame. The volume of fire was so great that the ordinary means of resistance were useless; woods, fields, villages, farm buildings, fences, crops, live stock, and their hapless owners were overwhelmed without chance of escape. Whole families were burned in their houses, or in the fields and roads while flying for refuge, or smothered in wells, their only resort from the flames which swept the surface. The Mayor of Detroit estimates that 750.000 acres were burned over, and as many as 15,000 persons made homeless and destitute. The whole area of the afflicted district was perhaps 10,000 square miles, with a population of 50,000 or more. Most of the people were new settlers, just getting a start in life, though the loss of property in the older settlements was heavy. The immediate loss of life is estimated at from three to five hundred. Many more were seriously if not fatally burned, and the exposure of houseless and bereaved women and children entailed great additional suffering, if not hazard of life.

Thanks to prompt and liberal contributions from Eastern and Western cities, much has been done for the relief of the victims; but hundreds have been impoverished, and years must elapse before the lately prosperous settlements can regain their lost position.

Lessons of this nature, happily not so severe, occur almost every year, certainly every dry season, teaching the unwisdom of the common practice by new settlers of surrounding themselves with materials for future conflagrations. Forests are cleared, and vast accumulations of brush, tree limbs, waste lumber, and the like are allowed to form on all sides. At last there comes the inevitable drought, with a chance that the rubbish will not yield to small and isolated fires. Ordinarily the brush fires are confined to the clearings, and are easily kept under control. Occasionally, as in the recent instance, and similarly ten years ago, a general conflagration ensues, and a terrible price is paid in property and suffering and loss of life for the neglect to burn the brush-heaps in detail and at seasons when they will not burn so readily.

It is only by concerted action on the part of all the members of a new settlement that this serious hazard of their lives and properties can be kept down, and it would seem possible that something in the way of general legislation might be devised to compel wood-cutters to clear up and burn up their rubbish as they go along. Without such laws for all wooded regions we must expect the periodical recurrence of calamities such as has now overtaken Eastern Michigan.

METALLURGY OF NICKEL.

At the recent exhibition of the German patents and designs the metallurgy of nickel and cobalt was illustrated in an interesting manner by Fleitmann & Witte, of Iserlohn. Dr. Kollmann describes it as follows:

It is only within a few years since the discovery of pure malleable and weldable nickel by Dr. Th. Fleitmann, that nickel has entered the rank of those metals which are technically employed on a large scale. Previously only the alloys of nickel with copper and other metals could be easily wrought, while pure nickel could neither be hammered nor rolled. The reason of this was that pure nickel absorbs (occludes) gases while melted (Fleitmann thinks it is carbonic oxide), and the nickel cannot be worked until these gases are removed.

Fleitmann's process for making nickel malleable consists in adding a very small trace, only one-twentieth of a per cent of magnesium, which is introduced in the form of a bar into the liquid nickel while in the crucible. This small percentage of metallic magnesium renders this brittle metal perfectly malleable, and it can even be welded. Magnesium is well known to oxidize very easily (at high temperatures) and hence serves to remove these injurious gases. (Would not phosphorus accomplish the same end?)

The extraordinary technical importance of the new discovery (which is already patented in all countries) is evident at once. Formerly alloys with comparatively only a little nickel could be used, say, for coin. The German 10 pfennig pieces (like the American 5 cent piece) contain only 25 per cent of nickel to 75 of copper. Now, on the other hand, we can have pure nickel cast in any desired shape, and also forge it and roll it like iron or steel. We may, indeed, assume with tolerable certainty that if Fleitmann's method had been known ten years ago we Germans would not have been pestered with our unhandy little 20 pfennig silver coins, for much more convenient ones could have been stamped from pure malleable nickel. Pure nickel, in addition to its malleability, possesses the great advantage that it does not lose its luster in moist air and is unaffected by organic acids, while its alloys, we know too well, gradually lose their luster and turn reddish.

Fleitmann, in his very interesting investigation, also made the discovery that pure nickel treated with a very little magnesium became weldable just like iron, and upon this he founded a method of welding nickel to iron. This discovery has gained very considerable importance, since we are now able to weld plates of nickel on both sides of the iron or steel instead of merely depositing on it a thin coating by electricity.

The question of welding, which is not yet settled in the metallurgy of iron for Bessemer metal, for example, may perhaps be solved in a manner similar to that in which Fleitmann solved it for nickel. Its importance technically and economically hardly can be overestimated. Nickel made by the new process with magnesium has a resemblance to carbureted malleable iron.

Kollmann made a series of tests of strength with Fleitmann's nickel, and arrived at a surprising result, namely, that the elasticity as well as the absolute strength corresponds exactly with those of medium hard Bessemer steel.

The expansion by rolling and forging of the two metals is the same, so that they can be rolled together.

Kollmann then gives some of the numerical results of his tests, which we omit, but they go to show that the physical properties of nickel and iron are very analogous, so that the thought arises that perhaps nickel is, after all, only an allotropic state of iron!

Since nickel and steel expand equally, blocks of nickel can be welded on both sides of an ingot of steel, and the whole rolled out into sheets of any desired thickness already covered with nickel. Iron wire covered with nickel could be drawn out just like ordinary wire. Another advantage is that the welding as well as the melting temperature of steel and nickel is close together, so that the nickelized steel can be welded as before.

Cobalt can be rendered malleable and weldable in the same manner, *i. e.*, by the addition of a little magnesium.

Fleitmann has also discovered that not only can nickel and cobalt be welded on steel and iron so as to form nickel plated wire and sheets, but that it can be welded on to the alloys of copper and nickel, which can be rolled at a very high temperature. In this operation the metals to be welded are surrounded with thin sheet iron, which is afterward dissolved off, or is heated in an air-tight apparatus. In this way, too, sheet iron can be combined with alloys of copper and nickel by welding.

To prevent articles made of nickeled steel or iron from rusting on the cut surfaces the iron beneath is dissolved away at the edges with dilute acids, and the projecting nickel then hammered down and welded over it. In Birmingham H. Wiggin makes nickel malleable by adding 2 to 5 per cent manganese.

THE GERMINAL VALUE OF NEW TRUTHS.

In his presidential address before the recent Medical Congress in London, Sir James Paget dwelt at considerable length upon the necessity of special studies in science and the impossibility of making any just comparative estimate of the relative value and importance of the several divisions of the science of medicine, or any other science, however widely they may seem to differ in present utility. This mainly for the reason that every fact in science, wherever gathered, has not only a present value, which we may be able to estimate, but a living and germinal power, of which none can guess the issue. The speaker added:

It would be difficult to think of anything that seemed less likely to acquire practical utility than those researches of the few naturalists who, from Leeuwenhoeck to Ehrenberg, studied the most minute of living things, the Vibrionidæ. Men boasting themselves as practical might ask, "What good can come of it?" Time and scientific industry have answered, "This good: those researches have given a more true form to one of the most important practical doctrines of organic chemistry; they have introduced a great beneficial change in the most practical part of surgery; they are leading to one as great in the practice of medicine; they concern the highest interests of agriculture, and their power is not yet exhausted."

And as practical men were, in this instance, incompetent judges of the value of scientific facts, so were men of science at fault when they missed the discovery of anæsthetics. Year after year the influences of laughing gas and of ether were shown: the one fell to the level of the wonders displayed by itinerant lecturers; students made fun with the other. They were the merest practical men, men looking for nothing but what might be straightway useful, who made the great discovery which has borne fruit not only in the mitigation of suffering, but in a wide range of physiological science.

The history of science has many similar facts, and they may teach that any man will be both wise and dutiful if he will patiently and thoughtfully do the best he can in the field of work in which, whether by choice or chance, his lot is cast. There let him, at least search for truth, reflect on it, and record it accurately; let him imitate that accuracy and completeness of which I think we may boast that we have, in the descriptions of the human body, the highest instance yet attained in any branch of knowledge. Truth so recorded cannot remain barren.

THE second-class steel armor-plated turret ship and ram Conqueror was launched September 8, at Chatham, Eng. She is of 6,200 tons, and her engines are of 4,500 horse power. Her armament will be two 25-ton guns.

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The Removal of the President.

The successful removal of President Garfield from Washington to Elberon, on the New Jersey coast near Long Branch, a distance of 240 miles, on the morning of September 6, afforded a striking illustration of the perfection of modern means of transit. The vitality of the wounded patient had sunk so low that it was morally certain that he could not survive for many days the heat and bad air of the Capital. As a last resort it was decided to remove him. The railway companies were notified, and in a few hours the necessary arrangements were made, including the construction of about a mile of railway from the Elberon Station to the cottage the President was to occupy.

Mr. Garfield was borne on a stretcher from the White House to a wagon, and slowly drawn to the railway station, where he was as carefully transferred to a car expressly fitted up for the occasion. The seven hours' journey by way of Baltimore, Wilmington, Philadelphia, and Trenton to the sea was admirably endured, a speed of a mile a minute being maintained at times without greatly discommoding the patient.

Opening of the Mechanics' Fair in Boston.

The second of the great exhibitions which Boston is having this fall was opened with due "pomp and ceremony," September 13, the Governor of the State, the Mayor of the city, and numerous other officials participating, with the military in the exercises. The attendance was large, so that the great building in which the fair is held was comfortably filled, and this, too, without lessening the crowds which all day flocked to the other exhibition, which had been about four weeks in progress. The fact that two such great shows are so well attended at the same time in a city no larger than Boston, and but moderately populous suburbs, not only speaks well for the management of these exhibitions, but tells of the active interest which nearly everybody in New England feels in manufactures and the mechanic arts.

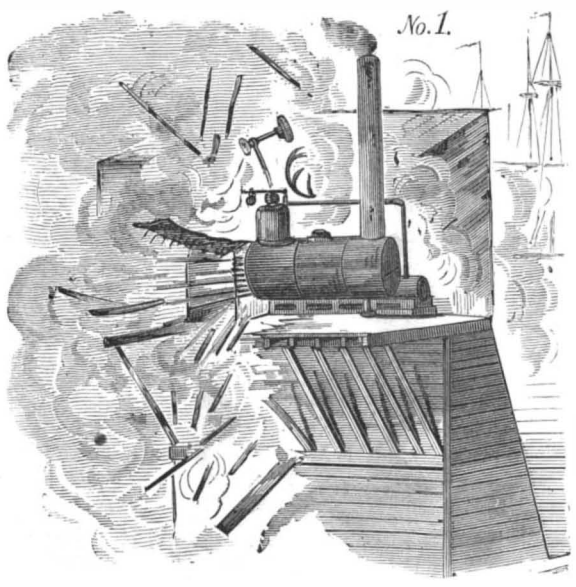
The building in which this exhibition is held is an ornament to the city, and is so well fitted for the purposes for which it was designed as to reflect great credit upon the managers of the Massachusetts Charitable Mechanic Association. It is triangular in ground plan, having a frontage of 600 feet on Huntington avenue and 300 feet on West Newton street, a section of the city which has been wholly made by "filling in" the "back bay" on the Charles River, and all of this new portion is being built up with public edifices and private buildings which reflect great credit upon Boston architects.

The exhibition building is in the Renaissance style, with free treatment. Distinct lateral lines, except that designating the basement, have been avoided. Arches of graceful curves rise nearly to the coping—giving space within their sweeps for numerous windows, through which the interiors are thoroughly lighted. These arches and the adjacent walls are massively laid in red brick with sills and caps of Longmeadow freestone and terra cotta ornaments. On one side of the main arch is a head of Franklin, on the other that of Oakes Ames, representing respectively electricity and railroading. They are surrounded by spandrels of palm, oak, and olive branches, in which appear the arm and hammer of the association's seal. Around the structure is a wide space of sodded ground, through which is laid a brick sidewalk, and in which are placed numerous gas and electric lights, under whose combined glow the beauties of the front are to be seen almost as plainly by night as they are by day. In the verdant triangle, at the eastern end of the building, a fountain of highly ornamental design is placed. An octagonal tower forms the easterly termination. It is about 40 feet in diameter and 90 feet high, and has in its upper story a lookout, from which a fine view may be obtained. There are two wide entrances into the tower, one directly from Huntington avenue sidewalk, the other through a covered porch and steps twelve feet wide, from the covered carriage porch, built of brick and stone, with hard pine open timbered and tiled roof. In the center of the octagon is the ticket office, and leading from it, and separated by a fence with three turnstiles, is a corridor 20 feet wide, which is the main avenue of approach to the exhibition halls. The administration building, which adjoins the tower, has a basement 15 feet high and three stories above it. At the left of the corridor, which runs through the building from the main entrance to the exhibition hall, is the president's room, a large apartment for the use of the president and directors of the association. Adjoining this is the treasurer's room; then comes a large room fitted with desks for the accommodation of the representatives of the press; and beyond this is the superintendent's office. At the right of the corridor is an elevator running from the basement to the upper stories; adjoining this is the janitor's room, the remainder of the space being occupied by toilet rooms and coat rooms. On the second floor of the administration building is the dining-hall, measuring 34 by 84 feet, and well finished. On the same floor, and separated from it by a corridor corresponding with the one on the main floor, is a private dining room for the managers of the association, the serving room, and ladies' toilet rooms. In the third story is a hall, 46 by 84 feet, which, during the fair, will be used for the military museum. At the close of the fair it will be handsomely finished for the use of the association, and will also be let for concerts, theatricals, lectures, balls, etc., the seating capacity being about seven hundred. It will have an open timbered roof, finished in hard wood, a hard wood floor, suitable for dancing upon, a stage, ladies' and gentlemen's dressing rooms, toilet rooms, committee rooms, etc. Five elevators are conveniently located in different parts of the building, giving ready access to each of the four floors on which the exhibits are arranged, and it is thought that, after the exhibition, and the reservation of the portions which the association will permanently occupy, the other parts may be so let as to cover the interest on a large portion of the money invested in the structure.

BOILER EXPLOSION ON A DRY DOCK.

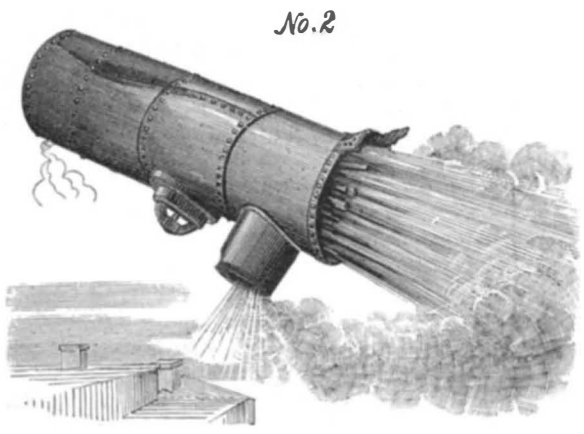
The steam boiler on Bollman & Brown's floating dry dock, foot of Essex street, Jersey City, opposite New York, exploded with astonishing violence on the morning of September 13. No intelligent engineer who examines, even in a cursory manner, the principal witnesses, namely, the corroded safety valve and the torn crown sheet, will be likely to doubt the cause, while the responsibility may almost as readily be placed.

Capt. L. D. Decker, of the iron tug Gladwish, and James Tammany, a calker, were instantly killed, both being

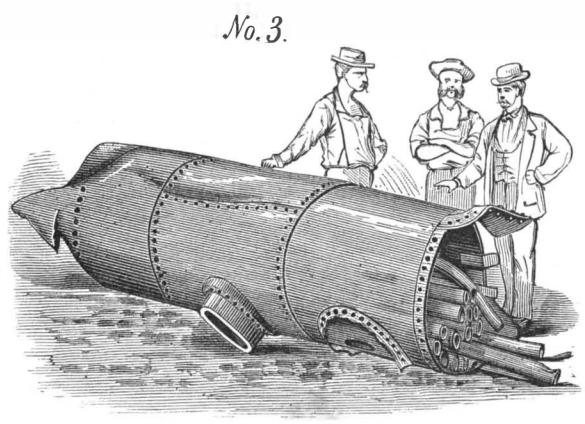


nearly abreast of the boiler and on the tugboat Gladwish, which was on the dock and about to be lowered after having undergone repairs. The names of the deck hands who were injured are John Smith, Alex. McQuinn, Walter Everson, who had temporary charge of the boiler in the absence of the regular attendant, and Victor Lambeck. Three of these persons will doubtless die of their injuries.

Sketch No. 1 shows how the boiler, which was of the locomotive type, was located on an overhanging platform, built upon the second section of the dock, about 20 to 25 feet,



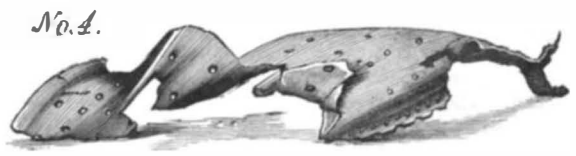
according to the stage of the tide, above the street level. It furnished steam to a 14" x 24" horizontal engine which stood alongside of it, through a 2½ inch wrought iron pipe flanged to the body of the safety valve, as shown in the engraving. The engine and boiler were covered by a shed building having a tinned roof, and they were used in connection with suitable gearing to pump the water from the four pontoon sections that composed the floating dock. The boiler was 16 feet long, including the 4 feet of the fire box



part (see Fig. 1) which was blown to pieces. The original form of this part is shown in dim outline, while the external sheet, with the screw stays attached, is seen spread out in the act of commencing its flight to parts unknown. Up to this time this plate has not been found.

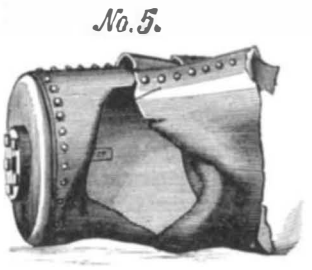
The top and sides of the inner shell of the furnace were flat and formed of a single plate, which was driven down upon the grate bars by the pressure as soon as the overloaded stays gave way by pulling through this plate. It fell upon the dock in the background of Fig. 1, and its condition is shown in Fig. 4. It is five sixteenths of an inch thick; and in another part of the firebox the quality is indicated as Glasgow C H No. 1 flange, tensile strength 50,000. The barrel of the boiler is three eighths, single riveted, and contained 37 tubes 3 inches in diameter and 10 feet long. The boiler itself, well made, is clean inside, and shows no defects indicating long use. It is said to be four years old.

There was no indication of overheating of the plate shown in Fig. 3, which would be the first uncovered portion of the fire



surface in case of low water in the boiler; but there was unmistakable evidence that the so called safety valve was and had been for some time absolutely inoperative. The iron stem of the valve was immovably fixed by corrosion in the iron bonnet of the valve case. This valve, which is of the wing pattern, is 2½ inches diameter, was loaded by lever and weight to blow off at about 60 pounds when in order.

On the morning of the explosion the engine was not running, the temporary attendant was absent, a brisk fire was burning, and there being no outlet for the steam the pressure accumulated till the boiler gave notice by leaking steam through the weaker seams of the fire-box. The young man in charge, on seeing this, was in the act of running to open the furnace door when the explosion took place. The stay bolts pulled through the inner plate, and the flat top of the furnace was forced down upon the furnace grate bars, and the outer shell plate was forced upward, as indicated in the sketch No. 1. The whole furnace part of the boiler was thus separated from the barrel, which, impelled by the issuing contents, flew like a rocket in nearly a direct line of its projected axis, as indicated by sketch No. 2, up Essex street, plainly marking its trajectory upon buildings and signs; it reached the ground after turning about one-fourth of a revolution on its axis, at a distance of about 300 feet, where it encountered and cut down a fire hydrant, leaving the marks of the fluted casting plainly embossed in the iron of the dome, which was crushed and detached from the boiler, as shown in sketch No. 5. At this point in its course it struck the curbstone, and several rivet heads were ground smoothly off as though by contact with a fast running dry grindstone, changing the iron to a blue color by the heat of the friction. Here also it struck two large trees near the ground and the man-hole yoke was broken off. It was diverted by contact with these objects slightly to the left, and thereby prevented from entering a large dwelling house, and continued by a single bound up the middle of the street to a total distance of nearly 750 feet from the starting point—demolishing two wagons, killing a horse, and finally resting upon a two-wheeled truck to which the animal was attached. The explosion was followed by a terrible roar of the expanding water, which so frightened the horses along the street that they ran away; and the people fled terror-stricken into the nearest buildings.



The safety valve was found after the explosion firmly fixed in its seat, in which it is rusted in. The coroner proposes to weigh the force that will be necessary to move the safety valve from its seat, and no doubt there will be many guesses at the pressure that was required to do this work of destruction.

This case is very nearly parallel to one that occurred at the works of the Standard Oil Company, in Centerville, N. J., in 1878, and from the same cause—overpressure from a defective safety valve. Some of the parts of that boiler, which was also of the locomotive type, flew a distance of 1,200 feet. The boiler was broken into twelve principal fragments, and scattered over several acres of open ground.

The lesson taught by these disasters is obvious and should be learned by every steam user. It is that no steam boiler is safe without an efficient and well kept safety valve.

The worn-out theory of low water as a common cause of boiler explosions must soon give way to the more common causes—defective safety valves and weak boilers. It has become a trite remark among engineers that the most stupid boiler attendant knows enough to keep plenty of water in his boiler, while, on the other hand, many well-informed engineers are too careless about their safety valves, and seem to think if once well fitted and properly proportioned it will remain a safety valve without trouble and care. There is now more than one observer of boiler explosions that believes that the Eleventh street explosion in New York City arose from leaving the fastening upon the valve after the annual hydrostatic test, simply forgotten by the person who placed it there.

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Strong Magnets.

For some time past M. Trouve, the eminent Parisian instrument maker, has been engaged in discovering the best mode of making powerful magnets of identical strength. For this purpose he has investigated the best kinds of steel, the most suitable degree of temper, and the most practical and simple method of magnetization. In testing the different kinds of steel, he cut the pieces of the same dimensions and magnetized them, then measured their portative force. They were afterward tempered and magnetized anew. The portative force after this second magnetization has led M. Trouvé to the conclusion that the best French steel for making bar magnets is that of Allevard, as already known. He also finds that the portative forces, as determined after the two magnetizations, are connected by a simple law, which can be expressed by saying that they are to each other in the ratio of $n : n^2$, that is to say, if the portative force of the first magnetization is represented by 2, 3, and 4, that due to the final or saturated magnetization is represented by 4, 9, 16. As regards the temper of the steel, M. Trouvé finds that a regular temper is necessary, and to insure this condition he employs a muffle furnace heated by gas to a constant temperature. The actual magnetization of the bars is performed by placing them in two solenoids in juxtaposition, and closing the magnetic circuit by means of two plates of soft iron. The solenoids are then electrified by means of the current from six Wollaston elements. By proceeding in this manner M. Trouvé succeeds in preparing bar magnets which will sustain from twelve to fourteen times their own weight, and if they are bent into the horseshoe form the portative force is quadrupled, that is to say, it becomes from forty-eight to fifty-six times the weight of the magnet.

Absorption of Oxygen in Coal Mines.

The Belgian Academy of Sciences has received a report on the researches made by M. Fabre, regarding the diseases to which coal miners are especially liable. He finds that, as coal absorbs rapidly up to one hundred times its own value of oxygen, the air which the miners have to breathe is deprived of oxygen to a hurtful degree; the atmosphere of a mine is also further vitiated by the gaseous carbon compounds given off by the slow combustion of the coal. M. Fabre concludes that a supply of air is more essential than that of light, and even the best ventilated mines require better ventilation.

A Suspended Aqueduct.

A cheap suspension aqueduct was invented and used by some miners in California in 1852. A river ran between two bluffs, one of which was considerably higher than the other. Water was available on the one, but it did not "pan out" as well as that upon the lower. Some sailors, including the mate of a whaler, took up a claim, and succeeded in making a hose of strong duck, about eight inches in diameter, and stretching it from the higher to the lower hill, by means of a strong rope running through it. Water was then carried through this weak hose, which could not have resisted the pressure if lowered into the valley, and the ingenious sailors realized handsome fortunes out of the land that had been hitherto worthless.

AN EASILY MADE CHAIR.

We give an engraving of a very cheap yet strong and comfortable chair which may be made as elegant as the tastes of the maker may dictate. The chair, as will be seen by reference to Fig. 1, consists merely of a barrel cut off above the second hoop so as to form a complete back with half arms at the side. The barrel thus cut is mounted on two strips of wood, having casters under their ends, and brackets above to form the legs and to add to the appearance of the chair. A head is fitted to the circular portion, and the whole is neatly upholstered, as shown in Fig. 2.

Of course it is necessary to select a good barrel bound with iron hoops, and a little care should be taken in the upholstering to disguise the barrel form as much as possible.

A Strong and Handy Cement.

One of the strongest cements, and very readily made, is obtained when equal quantities of gutta percha and shellac are melted together and well stirred. This is best done in an iron capsule placed on a sand bath, and heated either over a gas furnace or on the top of a stove. It is a combination possessing both hardness and toughness, qualities that make it particularly desirable in mending crockery.

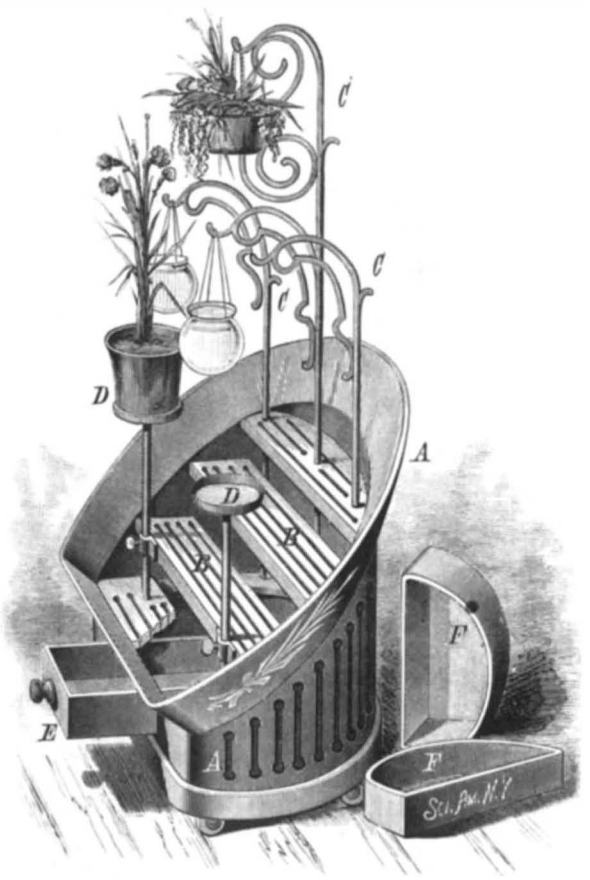
When this cement is used the articles to be mended should be warmed to about the melting point of the mixture, and then retained in proper position until cool, when they are ready for use.

Whooping Cough.

On an extended trial the author, Dr. Gaspar Griswold, of this city, finds *carbolic acid in whooping cough*, in doses of one-fourth minim to a child of six months, one-half minim for one of a year, and one minim for one of two years and upward, to be the best remedy. "The whoop goes; the vomiting ceases; the paroxysms are modified in intensity and frequency." This result he believes to "arise from a similar action to that of creosote on the motor fibers of the vagus to the stomach, and from a lowering of the vitality of the specific germ of whooping cough disease."

IMPROVED FLOWER STAND.

The engraving shows an improved ornamental flower stand lately patented by Mr. William D. McCallum, of Truro, N. S. The stand, as will be seen by the engraving, is intended not only for the support of flower pots and vases, but for hanging baskets, fish globes, etc. When properly filled it makes an elegant window garden, holding a great number of plants, while the ornamental brackets support the fish globes and hanging baskets, and form a trellis for the vines.



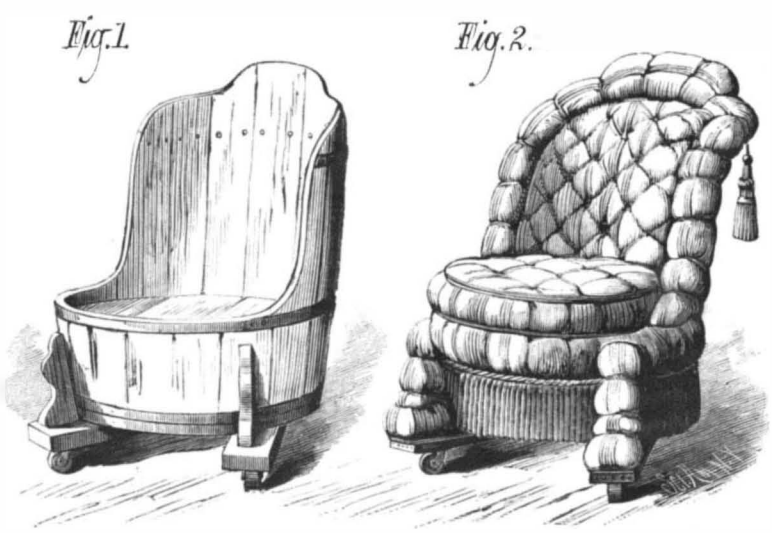
McCALLUM'S FLOWER STAND.

The capacity of the stand is increased by two or more vertical rods, provided with cups at the upper ends for receiving flower pots.

The flaring rim around the stand supports the foliage and prevents water from getting on the floor while sprinkling the plants.

A Naval Experiment with the Electric Light.

The Providence *Journal* gives an account of a trial of the electric light as used to detect the movements of vessels, at night, especially torpedo boats in time of war. The light is placed in a parabolic reflector, which is pivoted to turn in any desired direction and moved by a small electric engine in the horizontal plane of the motion. In this respect it seems to differ from the calcium reflectors that were often displayed on our streets, although hand power may be applied to the new reflector by detaching the small motor. The experiment was directed by Captain Selfridge, of the United States Navy, and with the United States steamship Nina and a small steam launch from the torpedo station of Newport, R. I. The launch was sent to the outer harbor, followed after some time by the Nina, fitted with a light on each side, to seek for her in the darkness. The launch was to play around and approach with muffled ores and hidden lights as near as possible to the Nina without being heard. The little craft was promptly detected at considerable distance as soon as the light swept over her locality, and the experiment was considered a success.



A CHEAP AND COMFORTABLE CHAIR.

RECENT INVENTIONS.

Mr. John K. Harris, of Springfield, Ohio, has recently patented a novel and comparatively simple construction of buttonhole worker, applicable to the ordinary sewing machines, which, for neat and substantial work, bids fair to greatly extend the use of this class of devices. In its general organization it comprises a cloth clamp that holds the cloth and oscillates it under the needle at right angles to the line of feed, first on one side of a center line, and then (after shifting its position at the end) returns on the other side of the center line, which center line is then opened or cut with a knife to disconnect the two lines of stitching and form the buttonhole. The cloth clamp is oscillated by a connection with the needle bar of the machine. The prominent feature of the invention is to be found in causing the lateral oscillation of the cloth clamp to be converted directly into a secondary intermittent progressive feed longitudinally with the buttonhole, by the direct impingement of the cloth clamp against an adjustable stop or resistance that causes the cloth clamp to react and move longitudinally, the length of feed and depth of stitch having always an automatic correlation to each other. This, in connection with the other features of the device, gives a nicety of adjustment and accuracy of work that must be seen to be fully appreciated. Mr. Harris has also patented other constructions aiming at analogous results.

Mr. Rece W. Trude, of Lock Haven, Pa., has patented a cheap, simple, and durable folding drier for drying clothes.

Mr. John J. McLean, of Hillsborough, Ill., has patented an improved folding case or cabinet for holding and preserving court and other papers for use particularly by clerks of courts. It is so constructed that the file papers in different causes on the docket may be conveniently selected from and returned to their respective pigeon-holes, and which will exhibit at all times the absence of papers and by whom taken.

An improved animal trap, patented by Mr. Russell Elliott, of Somerset, Ky., consists in a box divided into three compartments by two partitions, a sliding plate for closing the entrance apertures in the front of the trap, the rock shaft carrying the sliding plate, an oscillating treadle, and chains or cords connecting the treadle and the rock shaft.

An improved wardrobe bedstead has been patented by Mr. Ernest N. Doring, of New York city. This wardrobe bedstead is so constructed that the frames or cases of the bedsteads and the weight boxes can be readily disconnected, when desired, for convenience in moving the bedstead from place to place.

Mr. Fred Terstegen, of Elizabeth, N. J., has patented an eyeglass having the nose-piece or bow-spring jointed in the middle so as to permit the lenses to fold sidewise toward each other, and having the ends of the two sections of the nose-piece or bow-spring extended past the pivot and provided with locking devices for holding them in position for use.

Mr. Charles Oyston, of Little Falls, N. Y., has patented an improvement in syringes. The invention consists of a nozzle with flaring lip, containing several fixed crossbars and adjustable basket-like devices and a tapering screw thimble, by whose adjustment relatively to each other and to the crossbars the fineness of the spray issuing from the nozzle is regulated.

Mr. Albert Back, of New York city, has patented an improved box for packing and exhibiting ruchings, laces, embroideries, and analogous articles. The invention consists in a box provided with a reel pivoted to arms of one of the longitudinal sides of the box, which side is hinged to the bottom of the box so that it will swing outward into a horizontal position, the arms carrying the reel being in a vertical position, and thus permitting the reel to turn freely.

Mr. John M. Cookingham, of Hudson, N. Y., has patented a secure and inexpensive fastening that is durable and will not require openings cut in the inner case. This invention is applicable to hunting and open cases and key and stem winders; and it consists in a locking pendant fitted to slide on a stem and formed to lap over the case.

Mr. Joshua W. Trussell, of Rockland, Me., has patented an improved door securer for fastening doors, drawers, cases, or where locks are ordinarily used, in which a central shaft armed with sharp projections from two opposite sides is inclosed in a rectangular wedge-shaped frame, the shaft being provided with a thumbscrew head in one instance and a lever in the other, for turning it at right angles with the frame.

Mr. Bertram G Seebach, of Peru, Ill., has patented a composition for cleaning and polishing metals, consisting of potash, lime, mineral oil, and the oil of *Elais guiniensis*.

The American Institute Fair.

The annual exhibition of the American Institute Fair began September 15. As this is the fiftieth exhibition of the Institute special efforts have been made to celebrate its semi-centennial becomingly. The applications for space are said to have been larger than ever before, and the exhibition promises to be the finest ever held. But the exhibitors are, as usual, sadly behind in their preparations, and the exhibition opens in the customary state of unreadiness.

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COTTON AND ITS FUTURE.—AN OPPORTUNITY FOR INVENTION

The International Exhibition to be opened at Atlanta, Georgia, October 5, will not inaugurate a new industrial era for the South, as some have assumed, but will rather serve to convince the world that such an era is already well advanced.

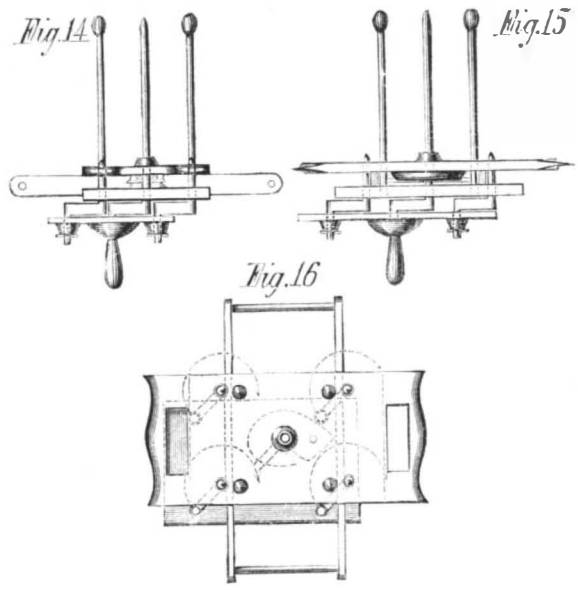
The enterprise began with the cotton interest, and was at first promoted for the especial furtherance of the industries which immediately turn upon the production and manufacture of the South's chief staple. That the scope of the exhibition has been widened to take in all the industries and resources of the Cotton States is both natural and encouraging; for while cotton is the leading interest, its prosperity must necessarily give life and energy to all the rest, and at the same time whatever forwards the general development of the natural and industrial capabilities of the South must react beneficially upon the cotton interest.

An immediate effect of the Exhibition is likely to be a great increase of knowledge among capitalists touching the opportunities which the South affords for profitable investments. But of still greater value probably will be the lessons learned by Southern cultivators with respect to means and methods of increasing the productiveness of their fields and the money value of their crops. Until recently the agricultural processess and appliances of the Southern planters have not been remarkable for economy and efficiency; and even yet the liberal adoption of modern labor-saving machinery is the exception rather than the rule in the South. It is true that in the aggregate the products of the Cotton States are enormous in quantity and in money value. The world is well aware of that. But not so many are aware that probably not a hundredth part of the productive capacity of the country has ever been developed.

RECIPROCATING HAND COTTON PICKER.

For the past five years the cotton crop has averaged nearly five million bales, and last year it approached six million bales; yet not more than two or three acres in every hundred available for cotton have been under cultivation, and on the land cultivated the yield has not been half as much in quantity or anything near as valuable as it might have been. During the census year the cotton acreage was 14,441,993 acres; the yield was 5,737,257 bales, or an average of 4 bales (of 475 pounds) to ten acres. Under proper cultivation and handling a bale to the acre is common, and two bales to the acre not uncommon. In his preliminary report on the cotton crop, Special Census Agent Hilgard remarks that even with the imperfect tillage and incomplete picking of the crop now prevailing in the Yazoo bottom (between the Mississippi River and the Yazoo, in the State of Mississippi), the average product per acre is over three quarters of a bale. Estimating the lands reclaimable by simple exclusion of the Mississippi overflows at only 3,000,000 acres, the annual product could readily be raised to 2,250,000 bales, without any change in methods of culture, on the Yazoo bottom alone. With improved cultivation, he says, the production could easily be brought up to 5,000,000 bales, and thus, with a similar improvement in the culture of the uplands, the State of Mississippi could easily produce the entire crop of the United States. He adds, in a foot note, that, so far from overestimating the possibilities within reach of careful culture, this statement does not adequately represent them. Without any stipulation as to improved culture Mr. Atkinson has estimated that one-tenth of the cotton area of Texas might yield as much cotton as the entire South now produces.

There is no ground for fear that the cotton market can be permanently glutted, provided the cost of the increased product can be kept sufficiently low. Not one in the hundred



REVOLVING SPINDLE—HAND COTTON PICKER.

of the population of the world has yet been reached by machine-made cottons, and the chief obstacle to the rest being made tributary to our cotton fields and cotton mills is a paltry fraction of a cent, perhaps, in the cost of a yard of cloth. The lowering of the cost of cotton to the cultivator, and the consequent extension of the area under profitable cultivation, can be brought about only by increasing the efficiency of the laborer and the productiveness of the soil. The first is being rapidly done by the introduction of improved cultivators, and the latter by the employment of fertilizers, by cleaner and more efficient methods of collecting and handling the fiber, by more thoroughly utilizing the hitherto waste products, and by the introduction of economical and effective remedies for the destructive cotton worm and similar pests: for example, by the use of pyrethrum solution, as recommended by Prof. Riley in another column of this paper.

Perhaps the most promising field of effort—at any rate the one in which successful effort would yield the highest results—is in the development of some practicable and economical method of gathering the lint by machinery. A device which should do for cotton picking what Whitney's gin did for the work of freeing cotton lint from the seed would give an incalculable impetus to the extension of cotton culture. The demand for such an invention is urgent, increasingly urgent. It is doubtful whether any phase of agricultural labor needs the aid of the inventor so badly, or promises so rich a return for successful effort. Already a crop amounting in value to three or four hundred million dollars is every year made difficult to secure, and subjected to serious hazard and no inconsiderable loss, through lack of efficient harvesting machinery; and any rapid increase in the crop is prevented by the lack of laborers at the critical season, laborers whose unattainable services might be dispensed with were it possible to relegate the work of gathering the cotton, in any considerable degree, to machinery.

As an illustration of what has already been accomplished in the direction of mechanical aids to cotton picking, we show on the front page of this issue of the SCIENTIFIC AMERICAN a dozen or more patented devices for use in the cotton field. How far any of them meets the requirements of the case we are not prepared to say. That none of them is entirely satisfactory would appear probable from the single fact that cotton is still picked by unaided human fingers.

The appliance shown in Fig. 1 was patented by Mr. William J. Lynch, of Old Town, Ark., and is designed to assist the cotton picker in supporting his body while stooping in the act of picking cotton, thus relieving the legs of weight that would otherwise come upon them. This device consists of two wooden staffs having foot rests pivoted at the bottom and provided with adjustable slides near the top, which are connected with a waist belt worn by the picker. The slides are provided with a clamp connected with the waist belt, so that when the staffs are thrown outward by the pressure of the knees the clamps bind the staffs and support the waist belt at that point.

The cotton harvester shown in Fig. 2 consists of a wagon having a straight body open at the top, and provided with a number of transverse stretched wires, over which the stalks of the plants are struck in such a way as to loosen the cotton from the bolls, when it falls into the wagon box. This is the invention of Mr. D. C. Hubbard, of Point Coupee Parish, La.

The cotton harvester shown in Fig. 3 is provided with a large picker cylinder covered with a close surface of bristles, forming a complete bristles brush face extending the entire length of the cylinder. This picker cylinder is revolved by connection with one of the drive wheels as the machine is drawn along over the rows of cotton plants. The bristles seize the ripe cotton from the pod without drawing out the unripe cotton or injuring the cotton or plants.

The machine is provided with a reel in front which bends down the cotton plants toward the face of the brush. There is a cleaning cylinder behind that draws the cotton from the picker cylinder and deposits it in the box at the rear of the machine. All of the rotating parts receive their motion from one of the supporting wheels of the machine. This invention was patented in 1872, by Mr. O. P. Meyers, of Canton, Ohio.

A machine, in some respects resembling that of Mr. Meyers, is shown in Fig. 4. In this machine there are four

ENDLESS CHAIN COTTON PICKERS.

vertical brushes, arranged in two pairs; one pair on each side of the row of cotton plants. These brushes remove the cotton from the boll and carry it into the receptacles arranged on either side of the machine. The brushes revolve against combs arranged along the vertical edges of the openings in which the brushes revolve. This machine is the invention of Mr. Thomas P. Moores, of Milliken's Bend, La. It was patented in 1880.

The principle of the machine represented in Fig. 5 is quite different from those above described. In this picker, series of barbed flexible rods are pushed down into the cotton plants in alternation, each in its ascent removing the cotton from the other, being assisted by brushes arranged along the edges of the vibrating arms. The cotton is carried from the tops of the arms by endless bands and delivered to a receptacle at the rear of the machine. This picker was patented in 1877, by Mr. Orren R. Smith, of Raleigh, N. C.

The cotton harvester shown in Fig. 6 operates by air pressure, the necessary vacuum being created by a horizontal fan driven by the supporting wheels of the machine. A series of shells or curved hoops loosen the cotton from the bolls, the hoops being inclosed by a hood, from which the cotton is drawn by the fan, and discharged into the wire cloth receptacle at the rear of the machine, the cotton being retained while the air is allowed free escape through the meshes of the wire cloth. This machine was

PNEUMATIC COTTON PICKER.

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patented in 1877, by Mr. F. Van Dorn, of Basking Ridge, N. J.

In Fig. 7 we represent an electric cotton picker, patented by Mr. Robert F. Cooke, of Brooklyn, N. Y., in 1870. In this machine two endless rubber belts, arranged vertically on opposite sides of the machine, are excited electrically by friction, the cotton plant being agitated by a reel, or otherwise, when the ripe cotton, being disengaged from the bolls, is attracted by the electrified belt, by which it is carried upward. It is disengaged at the top, and falls into a receptacle placed between the two belts.

Fig. 8 shows a hand cotton picker, patented in 1867, by Mr. Joseph E. Carver, of Bridgewater, Mass. This invention consists in a reciprocating tongue provided with teeth and fitted to an oblong box carrying a sack at its rear end. The box is provided with an elastic plate having spines, and when the tongue is reciprocated by the handle it takes the cotton from the boll, and, by moving it forward by a succession of steps, carries it into the box, from which it finally drops into the sack.

In Figs. 9 and 10 is shown a hand cotton picker, which is remarkable for its simplicity and cheapness. It consists of gloves provided with wire hooks inclining backward toward the wrist, and a brush worn upon the waistband over the bag or other receptacle intended to receive the cotton.

The ripe cotton is readily removed from the bolls by means of the wire hooks, and it is removed from the hooks by passing them over the brush. Figure 10 is an enlarged view of one of the fingers of the glove. This invention was patented in 1876, by Mr. R. A. Cutliff, of Shreveport, La.

A form of hand cotton picker, employing an endless chain carrying barbs, is shown in Figures 11 and 12, Figure 12 being a detail view of the stripper. In this device the endless toothed chain is driven by a sprocket wheel, and in turn drives a pair of winged wheels or strippers which remove from the chain the cotton picked from the bolls by the teeth, and allow it to fall into the bag attached to the under side of the apparatus. This invention was patented in 1866, by Mr. George A. Howe, of Brooklyn, N. Y.

Figure 13 represents a pneumatic picker applied by hand, the hose being connected with a fixed exhaust fan or pump. This is one of several similar inventions patented by Mr. John Griffin, of Louisville, Ky. The patent was issued in 1866.

The hand picker shown in Figures 14, 15, and 16 consists of a rotating spindle, having a crank by means of which it may be turned. The spindle is moistened continuously, so that when thrust into a cotton boll the cotton will adhere and wind upon the spindle as the latter is revolved. When the spindle is full it is placed over a basket, and a board—called by the inventor a "shedding board"—is moved outward along the four guide pins, and pushes off the ball of cotton.

In the engraving Fig. 14 is an end elevation, Fig. 15 a plan view, and Fig. 16 is a face view, showing the shedding board with handles in the ends. This invention was patented in 1879, by Mr. T. W. Ham, of Frosa, Texas.

For those of our readers who may be interested in this problem, and yet unfamiliar with the conditions under which a mechanical cotton picker must be operated, a few words with reference to the growth of cotton and the manner of its cultivation may not be out of place.

As the high bush or "tree" cotton which produces the long staple "sea-islands" cotton furnishes but a small part of the crop, we may assume that the picking machine will be primarily designed for the upland cotton fields. In these the cotton bush grows from two to four feet high, the more common height being under three feet. The branches spread like those of an apple tree in miniature, and the cotton bolls are distributed about the limbs somewhat as apples are on a sparsely-bearing tree. The green bolls, which are an inch or so in diameter, expand and burst at maturity, exposing the snowy fiber for which the plant is cultivated, the bolls on the lower branches usually maturing first. The bolls are supported by foot stalks from two to four inches long, and for the most part grow near the outer ends of the limbs. A pull of about one ounce suffices to draw the lint from the ripe pods. In gathering the lint it is needful to keep it free from leaves, stems, or fragments of the shell of the pods, all of which goes by the name of "trash," and impairs the value of the fiber.

The plants are set in rows, from two to seven feet apart, according to the quality of the soil, and are thinned out in the rows so that the plants are from two to four feet apart. In the extreme south the bolls begin to burst as early as the first of July; further north, the picking begins a month or two later. The picking continues at intervals or continuously according to the thrift and energy of the farmer until winter sets in or the crop is all gathered.

The more serious obstacles to mechanical picking arise from the irregular height and spacing of the plants; the irregularity in the maturing of the bolls; the necessity of avoiding injury to the plants in the earlier gatherings; the difficulty of withdrawing the ripe lint without admixture with husks, stems, and broken leaves.

The problem is a complicated one, yet it small aloud for solution and promises a liberal reward to any who shall solve it wholly or in part. If comparatively simple and inexpensive, the successful machine will bring a speedy fortune to the inventor, prosperity to thousands of small planters, occupation for multitudes of mills, and cheaper clothing for half the world.

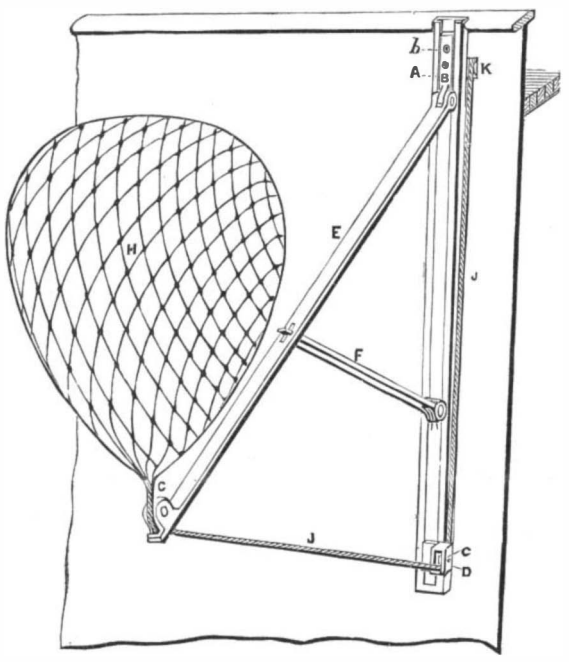
An Electrical Sheathing for Ships.

It has long been known that zinc, when in contact with iron, only preserved it from corrosion. A year ago Mr. J. J. Atkinson and Mr. C. F. Henwood, of London, taking advantage of this fact, patented a system of sheathing by means of a solder chemically combining atoms of zinc and tin. About three months ago a steam yacht was subjected to the process. The zinc sheets were attached to the iron by a dynamo machine, at spots about 9 inches apart, the connection being easily made by the melted solder. The iron below was left quite naked, so that there might be nothing to intercept the galvanic action. After a cruise of about 5,000 miles the vessel is reported as perfectly clean, while the iron below the zinc was absolutely without a trace of corrosion. The attachments formed by the solder were also so strong that in no place were they affected by an accident which the vessel met with. Experiments have proved that the wear of the zinc amounts to between 2 ounces and 3 ounces per square foot per annum, so that 20 ounces of zinc should last at that rate from six to nine years. The solder is the last to wear away, it being a much less negative metal than the zinc.

PREVENTING SHIPS FROM SINKING.

A recent modification of the application of the air bag method of preventing ships from sinking, or assisting in that when an accident causes a serious leak, is illustrated by the annexed engraving, as designed by R. G. Sayers, of London, England.

If the ship has sprung a leak or been otherwise damaged, and is expected to go down, each of the flexible bags is



filled with air as quickly as possible, the wing, E, and stay, F, being fixed in the position shown in the engraving; the bar, B, is lowered into the grooves provided for that purpose in the fixed bar, A, and is secured to the ship's sides by two or more bolts, *b*. The end of the rope, J, having been passed through the hole in the ship's side and over the pulley, K, to one of the ordinary winches or windlasses, or to a winch provided for the purpose, the bag is thrown overboard and hauled down into the water into the position shown. These operations, it is said, may be performed in eighteen minutes from the time of the disaster, therefore no vessel need sink at sea in future. The wing, E, and stay, F, serve to prevent the bag from chafing against the ship's side in case of a rough sea. Each bag with its apparatus being independent of the others, several of them can be filled and hauled down at the same time, according to the number of hands employed.

Longevity in Europe.

M. De Solaville analyzes in the *Revue Scientifique* the results of recent European censuses by ages, and the register of deaths also by ages. If we strike a mean of the census from 1869 to 1872, we find that Europe (exclusive of Russia, Turkey, and some small Southern states) possessed in 1870 a mean population of 242,940,376, classed as follows from the point of view of advanced ages: 17,313,715 of more than 60 years, 79,859 of more than 90, and 3,108 of more than 100 years; *i. e.*, 1 inhabitant in 12 of more than 60, 1 in 2,669 of more than 90, and 1 in 62,503 of more than 100. Women, M. Solaville finds, are more numerous in extreme old age than men, and the difference increases with the age. Thus at 60 years the advantage is with the women in the proportion of 7 per cent, at 90 and above it rises to 45, and with centenarians to 60 per 100. It is in France that we find the greatest relative number of inhabitants at the age of 60 and upwards; but it is not so for centenarians, of which France has less than all the other states of Europe except Belgium, Denmark, and Switzerland. From a calculation of deaths by ages the result is reached that, to the total deaths, those at the age of 90 and upward bore the following proportions to the countries named, and arranged according to the decreasing order of importance: Great Britain, 9·73; Sweden, 7·39; France, 6·58; Belgium, 6·07; Switzerland, 6·00; Holland, 4·47; Italy, 3·76; Bavaria, 3·42; Prussia, 3·06; Austria, 2·61. The result is in accordance with that we know of the mean age of the deceased in the same countries.

How Postage Stamps are Made

The number of ordinary postage stamps issued in 1881 was 954,128,440, and value $24,040,643. The method of printing postage stamps is as follows: The printing is done from steel plates, on which two hundred stamps are engraved, and the paper used is of a peculiar texture, somewhat resembling that employed for bank notes. Two men cover the plates with the colored inks and pass them to a man and a girl, who print them with large rolling hand presses. Three of these little squads are employed all the time, although ten presses can be put in operation, if necessary. The colors used in the inks are ultramarine blue, Prussian blue, chrome yellow and Prussian blue (green), vermilion, and carmine. After the sheets of paper on which the two hundred stamps are engraved have been dried, they are sent into another room and gummed. The gum used is made of the powder of dried potatoes and other vegetables mixed with water. Gum arabic is not desirable, because it cracks the paper badly. The sheets are gummed separately, they are placed back upward upon a flat wooden support, the edges being protected by a metallic frame, and the gum is applied with a wide brush. After having been again dried, this time on little racks, which are fanned by steam power for about an hour, they are put in between sheets of pasteboard, and pressed between hydraulic presses, capable of applying a weight of two thousand tons. The sheets are next cut in halves; each sheet, of course, when cut, contains a hundred stamps. This is done by a girl with a large pair of shears, cutting by hand being preferred to that of machinery, which method would destroy too many stamps. They are then passed to the perforating machine. The perforations between the stamps are effected by passing the sheets between two cylinders provided with a series of raised bands which are adjusted to a distance apart equal to that required between the rows of perforations. Each ring on the upper cylinder has a series of cylindrical projections which fit corresponding depressions in the bands of the lower cylinder; by these the perforations are punched out, and by a simple contrivance the sheet is detached from the cylinders in which it has been conducted by an endless band. The rows running longitudinally of the paper are first made, and then by a similar machine the transverse ones. This perforating machine was invented and patented by a Mr. Arthur, in 1852, and was purchased by the government for $20,000. The sheets are next dressed once more, and then packed and labeled and stowed away in another room, preparatory to being put up in mail bags for dispatching to fulfill orders. If a single stamp is torn, or in any way mutilated, the whole sheet of one hundred is burned. Five hundred thousand are burned every week from this cause. The sheets are counted no less than eleven times during the process of manufacturing, and so great is the care taken in counting, that not a single sheet has been lost during the past twenty years.

The postage stamp would seem to be only a humdrum sort of article, which fulfills a very useful, but withal extremely prosaic, purpose. Yet we learn from the Chicago *Inter-Ocean* that it can be made a delicate and subtle medium of delightful flirtation or romantic love, when skillfully manipulated by the sender of a letter and intelligently interpreted by the receiver, who by one swift glance at the stamp may instantly learn, from the manner of its affixture, whether to expect bliss or misery from the contents of the inclosed missive. The explanation of the whole matter, as given by the *Inter-Ocean*, is as follows: "Some ingenious persons have given a meaning to the location of a postage stamp on a letter. For example, they say that when a stamp is inverted on the right hand upper corner it means the person written to is to write no more. If the stamp be placed on the left hand upper corner and inverted, then the writer declares his affection for the receiver of the letter. When the stamp is in the center at the top, it signifies an affirmative answer to a question, or the question, as the case may be; and when it is at the bottom, or opposite this, it is a negative. Should the stamp be on the right hand corner, at a right angle, it asks the question if the receiver of the letter loves the sender; while in the left hand corner means that the writer hates the other. There is a shade of difference between desiring one's acquaintance and friendship, for example: The stamp at the upper corner on the right expresses the former, and on the lower left hand corner means the latter. The learned in this language request their correspondents to accept their love by placing the stamp on a line with the surname, and the response is made, if the party addressed be engaged, by placing the stamp in the same place but reversing it. The writer may wish to say farewell to his sweetheart, or *vice versa*, and does so by placing the stamp straight up and down in the left hand corner. And so on to the end of the chapter." There are in the world about six thousand varieties of stamps. The museum at Berlin contains between four and five thousand specimens, half of which are from Europe, and the rest are from Asia, Africa, America, and Australia. Among the many kinds of decoration which have been used on stamps are coat-of-arms, stars, eagles, lions, the effigies of five emperors, eighteen kings, three queens, one grand duke, several titled rulers of less rank, and many presidents.

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STEAM BOILER NOTES.

The absurdity of rating steam boilers by the extent of heating surface, meaning the areas that are exposed to the gases that emanate from the combustion of the coal, was made obvious, as it had been before, by some practical experiments made by Mr. J. Graham, an account of which was read before the Philosophical Society of Manchester, England, about the beginning of 1858. He placed a series of vessels along over the thoroughfare of the gases of a boiler furnace. The first one, being directly over the fire, represented the crown sheet and sides of a fire box boiler, or the fire sheet of an externally fired boiler; the second, third, and fourth vessels of the same size, corresponding in regard to efficiency to successive parts of a boiler toward the chimney. Their respective rates of evaporation were as 100 pounds for the first is to 27, 13, and 8 for the other three together, making 148 in a given time.

If, now, these had been a continuous boiler instead of separate vessels they would have had a common system of circulation, which might somewhat modify the results; but as it is not practicable to determine what each successive unit of a surface common to the same body of water would actually do, and as it is probable that the results, if they could be obtained, would not greatly differ, we may fairly make a comparison in boiler practice.

Mr. Perkins, some time about 1835, sought to establish the theory, in explanation of boiler explosions, that water thrown into superheated or anhydrous steam at high temperatures would flash into steam of a highly elastic character. But this is shown to be contrary to the deductions from the established laws of heat. Not only so, but experiments have uniformly failed to produce boiler explosions by this means. The experiments by a committee of the Franklin Institute, which were cited in the SCIENTIFIC AMERICAN of August 13, were full and exhaustive, and confirmed the laws of heat; they should be studied by every one who attempts to explain boiler explosions for the purpose of promulgating new theories.

Previous to the date of these valuable experiments the idea prevailed that boilers would not explode violently by a gradual accumulation of pressure, but would burst at the weakest place and harmlessly relieve themselves of strain. The eighth inquiry of the committee related to this subject. They made small iron and copper boilers, which they exploded by placing them in a sealed condition in a furnace prepared for the purpose in a pit. The pressure at which these boilers exploded was ascertained by a registering spring balance, so constructed as to be as safe as possible from injury.

One of these boilers exploded with a loud report, and was projected some distance, at a pressure of 172 pounds per square inch, 11½ atmospheres, "and," says the report, "stones and combustibles were widely scattered. A dense cloud of smoke and flame, capped by steam, arose from the pit."

A second experiment was with a copper boiler, with similar results, the difference being in the course of the rupture, which was along the head seam, it being weaker than the other joints from too close spacing of the rivets. . This second explosion occurred at a pressure of about 255 pounds, 17 atmospheres. The registering apparatus having been broken by the explosion, an accurate statement could not be made.

But Mr. Perkins' favorite theory, as he put it, was certainly plausible when applied to cases in which it was by their conditions admissible. It is still believed by great numbers of engineers who have not had the opportunity to observe for themselves to be a very common cause of explosion. It may be stated thus: water being allowed to get too low, the plates become overheated and superheat the steam, which, it was claimed, would contain a large quantity of heat. And here is where the fallacy lies, for steam has only a limited capacity for heat in its gaseous state, and, of course, can yield no more than it contains to bodies that come in contact with it in falling to the equilibrium due to the mixture or to the contact. The theory then supposes that water is mingled with the highly heated steam either by being pumped in upon the hot plates and quickly evaporated, or projected in the form of foam into the hot steam, forming a highly elastic vapor with explosive suddenness; or else the water remaining in the boiler below the heated plates is suddenly lifted by its contained heat and covers them, on a relief of pressure occurring from sudden escape of steam from the safety valve or by an open throttle valve on starting the engine.

This theory was first contested by Dulong upon deductions from the known laws of heat, and others have since proved by experiments the soundness of his conclusions. A writer in the journal above quoted declares that steam has been superheated to a temperature corresponding to 900 pounds per square inch of saturated steam, but not being saturated its pressure was less than 120 pounds per square inch. In this state sufficient water was injected to completely saturate it, which, instead of causing an explosion, lowered the pressure to 70 pounds.

The writer cited refers to the same experiments that are above referred to above, in reporting which the committee say: "We see that in no case was an increase of elasticity produced by injecting water into hot and unsaturated steam, but the reverse."

Some time previous to 1849 a gentleman of Brooklyn, N.Y., claimed the Rumford Medal of Harvard University on account of a discovery which seemed to him to fulfill the specification governing its award. He believed that steam heated out of contact with water became transformed into a new chemical compound, or perhaps a simple permanent gas, possessing valuable properties that rendered it more efficient as a vehicle of heat for the steam engine. He called this newly discovered body "stamm." His communications, having been published in the SCIENTIFIC AMERICAN, fell under the observation of Dr. Haycroft, of Greenwich, England, who made some experiments, first in a small way, which established his faith in "stamm." His first experiment, which appeared in the SCIENTIFIC AMERICAN, May 10, 1850, was with a steam engine and a tubular condenser. The cylinder was fitted with a steam jacket. He worked the engine first with common saturated steam, which was condensed, and the resulting water measured from a given volume of steam, the volume used being determined by counting the strokes of the engine piston. One hundred and seventy strokes yielded sufficient water to fill a given measure; but on admitting steam at a temperature of 440°, or somewhere near 500 pounds pressure per square inch, 1,800 strokes or charges of steam were required to fill the same measure with condensed steam, which seemed to indicate a very great gain. From this the experimenter was induced to believe the "stamm" was at least ten times more economical than steam. He therefore had a large engine built, and placed its cylinder in the fire, which, of course, was soon destroyed, although for a time it seemed to be successful. Subsequent experiment and calculation showed him that "stamm" returned to steam precisely such as was described by former investigators and engineers, and at atmospheric pressure occupied about 1,700 times the space that was occupied by the water from which it was generated. In consequence of the demand of Mr. Frost, the discoverer of the supposed new body or new property of steam, for the Rumford medal, some experiments were made at Harvard on the effect of superheating steam upon its expansion, which showed that 1,580 units of volume at 212° Fah. became 1,600 when heated to 216° Fah., and 1,630 at 228°, and their decision was against granting the medal to Mr. Frost.

The experiments have been since carried to an exhaustive extent, which prove that out of contact with water anhydrous steam obeys the laws of heat and expansion that govern simple gases, and that steam is a permanently gaseous compound while kept at a high temperature. It seems to follow, therefore, that when steam overcharged with heat falls by expansion in the steam engine to a temperature due to its pressure, it becomes saturated steam again, and at last water when given up its latent, which is less as the tension increases while in contact with the water of generation.

An Indiana correspondent some time ago seemed to misunderstand Mr. Zerah Colburn's teachings in boiler explosion, and imputes to him a similar theory to Perkins. But Colburn seemed to have no hobby or universal theory as most writers on the subject have had. Our correspondent properly says, "a boiler will not explode merely from suddenly injecting a large quantity of cold water into the steam space; it would merely lower the pressure."

Perkins' theory was doubted by Colburn, and figures were made to show its fallacy.

A terrific boiler explosion occurred near the west end of Third Street Bridge, in West Bay City, Mich., August 22, killing James Kealy, of Bay City, William J. Abrams, of West Bay City, and severely scalding Edward Finneron. The boiler was of the kind used for running thrashing machines, and at the time of the explosion was engaged in running a saw, sawing cedar blocks for the pavement in West Bay City. Abrams was cut in two by the boiler and horribly mangled. Half of his body was thrown over a slab pile 150 feet northwest, and the remainder to the north about half the distance. His head was terribly disfigured. He had been working here for two months as engineer. He was between 35 and 40 years of age, and it is thought came from Caseville. Mr. Kealy was 25 years of age and a native of Bay City, having a wife and child. He had been engaged by the contractor to saw the blocks, and was superintending the work when the boiler exploded. He was struck by a piece of iron on the neck, and was almost beheaded. He was blown about 50 feet north, and was alive when found, but died directly afterward.

Finneron was standing by Mr. Kealy's side at the time of the explosion, but was not struck by the flying pieces. He was, however, scalded very severely about the face and shoulders. A 14 year old boy, named Will Craft, who was standing on a raft of logs to the eastward about 50 yards, was struck on the hips by something, supposed to be a belt, and knocked down. Pieces of the boiler and engine, and the wagon on which they rested, were blown in all directions. The accident is the most terrible that has happened here in several years, and consequently there is no little excitement.

The jury of inquest returned a verdict to the effect that the explosion was caused by low water and the incompetency of the men having the boiler in charge.

The boiler at Henry Moody's sawmill at Campbellsville, Ky., exploded August 29. Henry Gaines was killed instantly, and John Fletcher and Samuel Cook were fatally injured. Benjamin Allen was badly scalded, but will probably recover. Two other employes were injured, but neither seriously. The explosion is said to have been caused by the use of sulphur water in the boiler.

Mineral waters should not be used in steam boilers; not so much on account of the possibility of an explosive compound being formed, as on account of the large amount of solids that are precipitated when these waters become concentrated by boiling. Sulphydric acid may arise from sulphur water, and although the gas mingled with certain proportions of oxygen is explosive, that is, it burns rapidly and completely when ignited, yet it is highly improbable that it ever was the cause of an accident to a steam boiler by taking fire and exploding in the presence of saturated steam.

The boiler on a hoisting sloop at Haverhill, Mass., exploded August 25, injuring two men, one seriously. The boiler was "old and unsafe, and there were 80 pounds of steam on."

The boiler of a thrashing machine exploded near Patoka, Ill., September 3. Six men and a woman were killed, and some of them horribly mangled. Several others were seriously scalded.

AJAX METAL.

About sixteen years ago, Mr. Francis J. Clamer, after considerable research, hit upon a peculiar chemical amalgamation, having copper for its base and possessing extraordinary hardness and tensile strength. This substance the inventor manufactured for some years under the name of "Ajax metal." The great usefulness of the article in various arts and industries having become widely known, Mr. Elkins, of Philadelphia, at the beginning of the present year, made a business arrangement with the inventor; invested a large amount of capital in buildings and machinery; and, under the name of the Elkins Manufacturing and Gas Co., began the manufacture of the substance on a large scale. At the present time, we are informed that the daily production is about 14,000 pounds, with a demand fully equal to that amount. To meet the requirements of the various industries in which the Ajax metal is applicable, the company furnishes this product in three different grades.

One of these, and perhaps the most important, is for use in the manufacture of bearings for steam and horse cars and machinery generally—a purpose for which long experience has proved it superior to any other metal or combinations of metals known. A second grade is designed especially for making steam and acid valves for use in coal-oil refineries, chemical works, and other industries where the application of ordinary metals for such purposes is attended with constant loss through corrosion.

The third grade is especially adapted for making fine ornamental castings (such as statuary, chandeliers, etc.) in greensand—a purpose for which it is peculiarly fitted, owing to the fact that the fluidity of the molten metal is such that the finest lines in the pattern are in every case exactly reproduced in the casting.

These various grades of the Ajax metal, which are furnished either in ingots or in castings made from patterns furnished the company, all possess the same characteristics of hardness and closeness of grain, and the same enormous tensile strength of 29,300 pounds to the square inch.

In addition to the foregoing, the company manufacture three grades of the metal in sheets. The first of these resembles 18-carat gold in color, and can be spun into almost any shape desired without annealing and without any danger of fire-cracking. It can be brazed with the hardest copper smith's solder without burning, and will take a very high polish, fully equaling that which is given to gold. The second grade is of a lighter shade, but has the same toughness as the first; while the third is of the same color as high brass, but very much stronger than that metal.

The jeweler's plating composition, made by this same house, and furnished in either bars or sheets, is now so well known to manufacturing jewelers that it scarcely requires description. It need only be said that it possesses the same hardness as that of the gold generally employed for plating, and will roll out even with the gold without causing the latter to crack, thus obviating a trouble and an expense to which manufacturers of jewelry have hitherto been subjected. The great usefulness of the Ajax metal in every application where toughness, hardness, tensile strength, and consequently great durability are requisite, promises a still wider field for its employment than we have briefly noted above, and its manufacture is probably destined to be ranked among our most prominent American industries.

Grain Storage in and around New York.

The great grain elevators and warehouses of this port provide storage for 22,800,000 bushels. Their capacities are given as follows: New York Central, 2,300,000 bushels; New York, Lake Erie, and Western Railroad, Jersey City, 1,500,000 bushels; Pennsylvania Railroad, Jersey City, 1,500,000 bushels; Dow's Elevators, Brooklyn, 2,500,000 bushels; Hazeltine & Annan's Elevators, Brooklyn, 2,500,000 bushels; Grain Warehousing Association, Brooklyn, 6,000,000 bushels; Robinson's Stores, Erie Basin, 2,800,000 bushels; Pinto's Stores, Brooklyn, 1,000,000 bushels; Woodruff & McLean's Stores, Brooklyn, 1,500,000 bushels; other elevators in New York and Brooklyn, 2,200,000 bushels.

The stock in hand August 27 was: Wheat, 3,882,051; corn, 3,070,716; oats, 2,817,638; barley, 7,041; rye, 9,692; peas, 9,713; malt, 82,273—total, 9,879,124.

The Cost of Carelessness.

The report of the New York Board of Fire Commissioners just issued gives a very interesting table, showing the number of fires in the city between June 1, 1868, and January 1, 1881, which were distinctly raced to carelessness, and the loss that has been sustained thereby. The principal items included carelessness of occupants with matches, lights, cigars, hot ashes, 4,689; children playing with matches, 887;

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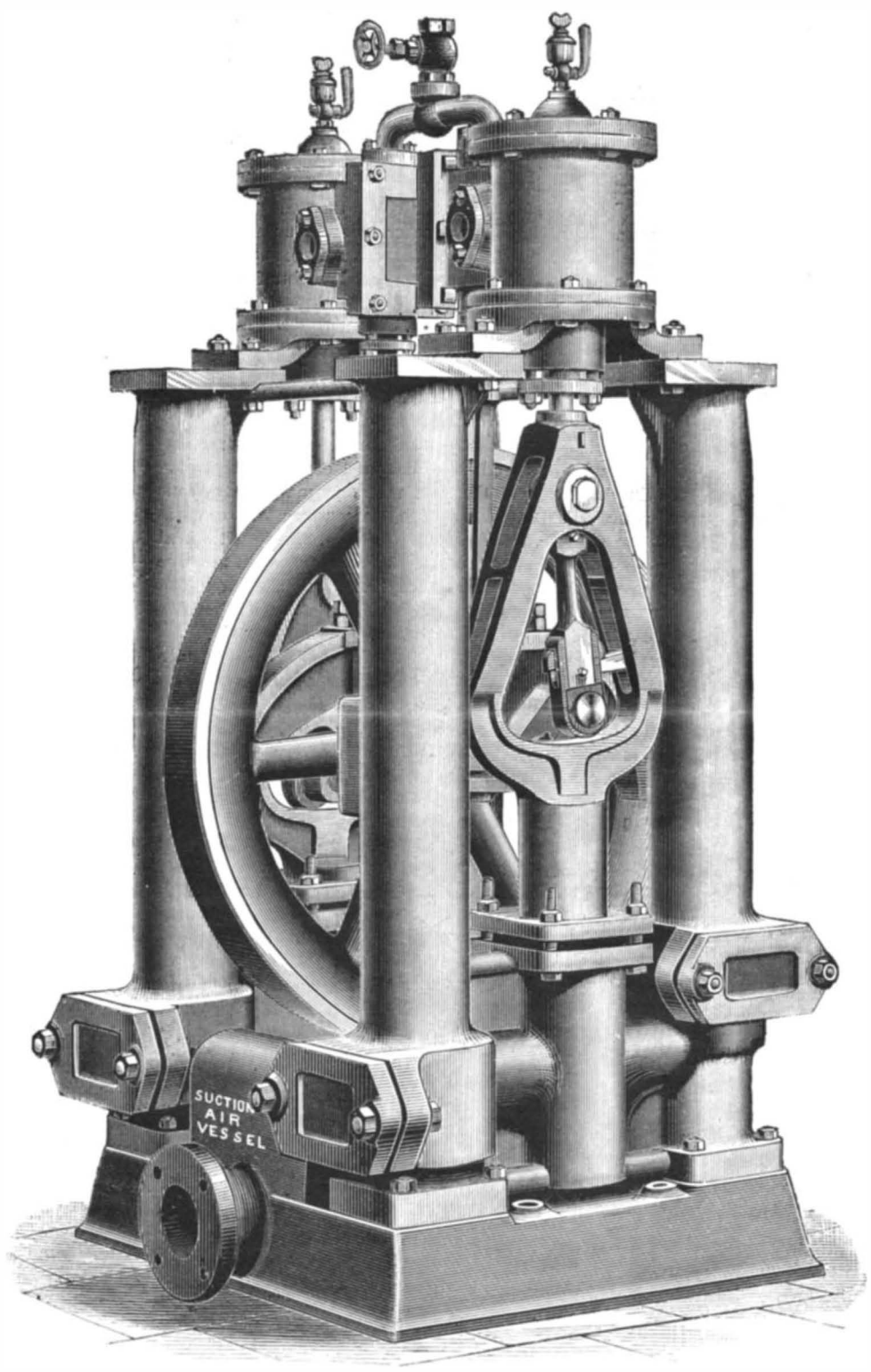
defective flues and furnaces, 687; bad arrangement of stoves, 275; escaped gas, 345; fat, varnish, etc., boiling over, 323; foul chimneys, 1,729; fireworks, 482; heat from grates or flues, 340; hot coals from grates, 133; incendiary, 347; kerosene lamps falling, 1,287; overheated stoves and pipes, 858; sparks from chimneys and engines, 900; spontaneous combustion, 457; vapor of naphtha, gasoline, etc., 88; window curtains catching fire, 907; malicious mischief, 236. Of the 17,500 fires that occurred in the city during the period named, about 15,000 are accounted for under some of the above heads. With the exception of incendiary or malicious mischief, there is not one of them that might not have been prevented by ordinary care and forethought. It is estimated that at least a hundred million dollars is the money value of the loss sustained.

IMPROVED DOUBLE-ACTING STEAM PUMP.

The accompanying illustration represents a double-acting steam pump which for simple but substantial construction and effective and reliable working has gained considerable favor in England. It is the specialty of Hulme & Lund, Manchester, and is particularly suitable for the drainage of deep mines, some pumps of this class being at work at the present time forcing water 1,200 feet vertically in one lift. Four substantial columns support the steam cylinders and serve at the same time as air vessels for the pumps. The steam valves are of the ordinary kind, worked directly from eccentrics on the shaft below. The water valves are furnished with separate bonnets or doors, and are therefore at all times capable of easy inspection. The flywheels are heavy, and are turned true, so that they run with accuracy and will carry a belt for driving purposes. In all parts the most suitable materials are employed. The connecting rods and shafts are made of the best scrap iron, the piston and valve rods of steel, and the glands, bushes, steps, eccentric straps, and water valves are all of the best gun metal. The pistons are furnished with metallic packing, and the joints throughout are planed and faced. All the working parts and the packings are easy of access and of ready adjustment. Pumps of this class are specially made, capable of pumping against any pressure up to 1,000 lb. per inch.



DOUBLE-ACTING STEAM PUMP.

A Hoisting Engine without Drums.

A simple and effective hoisting plant has been put into an underground shaft of the Maria Colliery, near Hoengen, in the Wurm District. The endless wire rope reaching down to the lowest part of the shaft, 886·5 feet deep, lies on a sheave placed directly over the shaft. The diameter of the sheave is made to correspond to the distance between the centers of the two hoisting compartments. The sheave has a very deep groove, so that the rope cannot slip. The cages, for two mine cars of 1,000 lb. capacity, are placed side by side, so that there is room for a wrought iron tube, through which the rope passes. The cages are fastened to the rope by strong screws. The two-cylinder hoisting engine is placed on a level with the center of the sheave and runs it through the medium of gearing, which acts upon cog wheels wedged on to each side of the rim of the sheave. Drums are thus entirely dispensed with. The engine, which is run by compressed air, has 13·4 inch cylinders and 31·5 inch stroke, with a Farcot expansion gear. It is running with 60 lb. pressure, and can easily manage 200 tons per shift of 12 hours. It is noted that the machine occupies little room, because there are no drums, and the sheave need not be placed as high. The wear of the rope is less, because it is only bent once, and the position of the hoisting cages may be readily changed. The *Zeitschrift für Berg-, Huetten- und Salinen-Wesen*, from which we gather the details given above, calls attention to the fact, however, that in case of breakage, the cages and the rope would be a total loss.

Prolific and Long-Lived Families.

The Hartford, Conn., *Post* says that among recent applicants for life insurance was one of 53 years, whose fifteen living sisters were from 35 to 63 years old, their ages running as follows: 35, 36, 38, 40, 42, 43, 45, 47, 49, 51, 55, 57, 59, 61, 63. Another applicant stated that he was 37 years of age, and that he had eleven brothers and ten sisters. His father died at the age of 65 years, but his mother was living at 67 and was in good health. The ages of the children, twenty-two in number, ranged from 16 years to 47. The applicant was a Virginian. A third case was of a man 32 years of age, who had eleven brothers and five sisters. His father was 68 years of age, and had just married his fifth wife. An applicant from Brooklyn belonged to a long-lived race. His father had died at the age of 80 years, his grandfather at 108, and his great-grandfather at 110 years of age, the average age of the three being a trifle less than 100 years.

Distilling Alcohol by Ice.

M. Raoul Pictet, of Geneva, so well known for his discoveries of the liquefaction of gases, announces the discovery of a method of distilling alcohol by ice. Two kilogrammes of ice are needed for the production of a liter of alcohol; that is, for the distillation of 110 gallons of alcohol a little less than a ton of ice will be required. The cost of production will include only coal for working the steam engine which drives the air pump, and the sulphuric acid, the evaporation of which produces the ice. M. Pictet declares that this will notably diminish the expense of distillation.

Large Cast Iron Wheels.

Three flywheels have been lately cast at Mr. Lycett's foundry, Wolverhampton, England, each wheel weighing 40 tons in the rim, and cast in one piece. The diameter is 26 feet; depth, 23 inches; and measure across the face, 15 inches. Each rim will have eight arms affixed, which will weigh about 25 tons, making the total weight of each wheel 65 tons. Flywheels weighing 60 tons have been cast in this district before, and some of them with a diameter of 30 feet, but it is believed that they have all been cast in either two or four segments, one great reason for this being that it would be impossible to convey such a ponderous piece of machinery *en masse* along a road. Casting them whole reduces the cost. The operation of casting occupied seven minutes.

NEW INVENTIONS.

Mr. Daniel D. Clark, of Mystic, Conn., has patented a new device for removing the motes that fall down from the saws of a cotton gin when the lint is being brushed off of the saws. The invention consists in providing a cotton gin with a mote receiver, consisting of a longitudinally flanged cylinder that straightens the cotton it leaves the saw, knocks the sand and trash out of it, and deposits the motes in a receptacle beneath it.

A new and improved tie for bales of cotton, hay, wool, etc. has been patented by Mr. James L. Griffin, of Cusseta, Tex. The invention consists in a metal band provided with a series of longitudinal slots at each end in combination with a plate with a button fitting into these slots on its under side, this button being passed through the slots of the two overlapped ends of the strip or band, then turned a quarter revolution when the bale has been compressed sufficiently.

An improved saddle girth fastening and harness buckle has been patented by Messrs. Isaac I. Lancaster and Homer A. Sears, of Goldendale, Washington Ter. The invention consists in a novel construction of a plate and a pair of pivoted spring pawls, a novel girth, and certain details of construction by which provision is made for securely and quickly tightening or loosening the girth.

Mr. William A. Lorenz, of Brooklyn, N. Y., has patented an upright piano case. The object of this improvement is to utilize the tops of upright piano cases for holding books, sheet music, etc., by making it possible to open a cover or lid for the purpose of increasing the volume of sound without disturbing the top.

Messrs. F. W. Jensen and Carl J. L. Olsen, of New York city, has patented an improved hospital bed. The improvement relates to the construction of the bedstead, and to devices combined therewith for the use of the sick person. The inventors use an iron frame bedstead, the bottom of which is formed by longitudinal rods sustained by crossbars and held in place by nuts at their ends. The head and foot boards are hung in slots in the side rails, so that they can be adjusted or swung down out of the way to give free access to the person on the bed. Combined with the bed there is a swinging arm carrying a vessel fitted for being raised to carry the vessel through an aperture provided in the bed bottom and mattress. The bed is also fitted with devices for automatically removing and replacing the cover of the vessel as it is moved to and from its place.

An improved apparatus for removing snow and ice from streets has been patented by Mr. Oscar F. Boomer, of Brooklyn, N. Y. The invention consists in laying steam pipes along the street gutters for receiving the exhaust steam from the boilers that are used for heating or mechanical purposes in the buildings bordering on the streets, or for receiving steam from other sources especially arranged for that purpose.

A combined desk and folding wardrobe bed has been patented by Mr. Ernest N. Doring, of New York city. The object of this invention is to furnish folding wardrobe beds provided with desks so constructed that they can be opened and used with as much facility as though they were only desks, and which at the same time will not interfere with the opening and closing of the wardrobe beds.

Destruction of Fish by Torpedoes.

The alarming destruction of the fish in many of the Indiana streams by means of dynamite torpedoes, has led to the organization of a State Fish Protection Society, of which Alexander C. Jameson is president. County and local societies are to be formed throughout the State to assist in enforcing the new fish law. Unless steps are speedily taken to prosecute the vandals who are using these torpedoes so destructively in some of our streams, the fish will to a great extent disappear.

The manner in which the dynamite fisherman operates is to sink the torpedoes in the holes or deep water in the streams, and set them off with a fuse. The concussion is so great as to kill or stun all the fish within a radius of fifty feet or more, when they rise to the surface of the water. The larger ones are then scooped up in nets, and the smaller remain to rot and taint the air.

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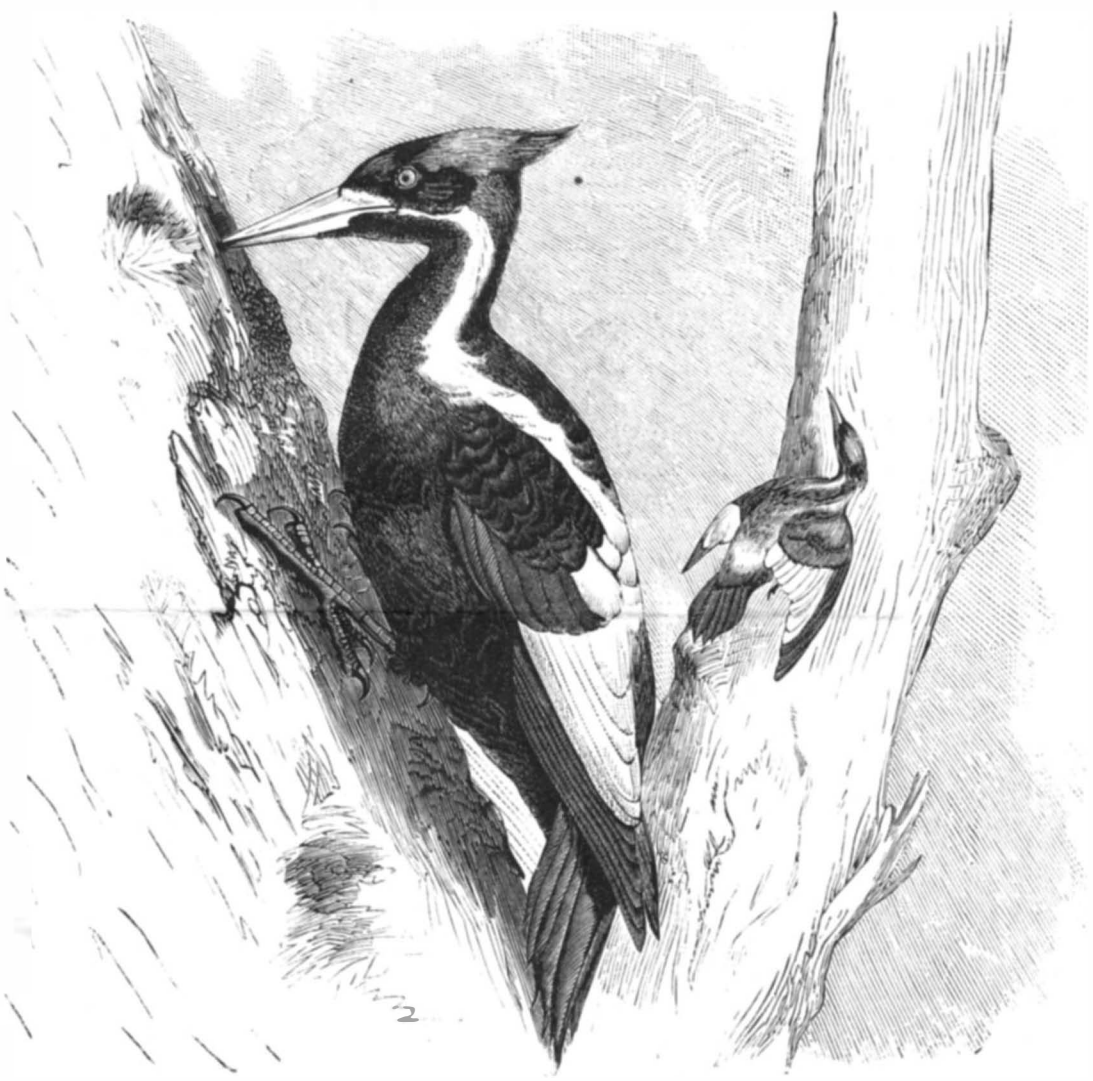
WOODPECKERS.

The peculiar characteristics of the woodpeckers are the construction of the beak, the feet, and tail. The beak is constructed for chipping away the bark and wood, the feet giving them the power to hold fast to the trunk of the tree, and the tail to support them in position, which gives to their strokes the greatest force. Their beaks are long, powerful, straight, and pointed; their feet, formed for grasping, are set far back upon the body; their tails are short and stiff, and act as props when pressed upon the rough bark. Woodpeckers were for a long time thought to be injurious to trees, but that prejudice naturalists now agree was wholly an error. Often, in walking through the woods or orchards, there will be seen strewn in profusion, at the foot of a tree, flakes of bark and chips of wood, sure signs of the woodpecker's industry. It looks as though a work of destruction was being carried on, but these flakes, having become separated from the living bark of the tree, were mere excrescences under which insects and their larvæ found shelter, and to obtain them for food the woodpecker removes the dead flakes of bark and wood, so that in reality, instead of being an enemy to the farmer, he is one of his most faithful servants.

The woodpecker makes its nest in a tunnel which it excavates in the *unsound* timbers. Water, when admitted to a tree, causes its center to decay; but if a perforation is made through the trunk, gallon after gallon of dark brown water will rush out, mixed with fragments of decayed wood, showing the extent of the damage done. This often occurs when a branch has been blown off close to the trunk; the woodpecker is quick to discover it, and begins to cut a tunnel.

Wilson and Audubon both state that many of our woodpeckers will excavate tunnels in apparently sound and undecayed wood, boring through several inches, till they reach the decayed portions of the center of the tree.

The burrowing powers of the great giant gray-bellied woodpecker are marvelous, its chisel-like beak having been known to chip splinters from a mahogany table, and to cut a hole fifteen inches in width through a lath-and-plaster partition. Even the small downy woodpecker is able to bore its way through solid wood of a tree, making an ingenious nest, the burrows sloping for some six or eight inches, then being driven perpendicularly down the tree. The tunnel is barely wide enough to admit of the passage of the body of the bird. But the perpendicular hole is roomy, and is fitted up in a style sufficient to dignify it with the name of a chamber. The male and female woodpeckers labor alternately in the burrowing and making of the nest, but they find an implacable enemy in the saucy little wren, who, when the woodpeckers' apartments are ready for occupancy, coolly takes possession, and holds them against the builders and proprietors, notwithstanding their vehement and noisy expostulations.



WOODPECKERS.

Picus principalis is distinguished by a superb red carmine crest and bill of polished ivory. This is indeed no common bird, but is a king among his kind. No fence rails for him to perch upon, but rather the tops of lofty trees, the giant pines of the cypress swamps, where the trumpeting notes and loud strokes awaken and reawaken the echoes. From the base of some of these enormous pine trees cartloads of bark have been removed, and the trees so perforated with holes that it would seem to be impossible that it was the work of birds.

The Sense of Hearing.

Some observations on hearing have been lately recorded, which suggest striking analogies between that sense and vision. Herr Urbanttschitsch, in *Pfluger's Archiv*, indicates a way of demonstrating "fatigue" of the ear. Two tubes having been adapted to the ears so that a given sound equally affects the latter, a strong tuning fork is vigorously sounded and brought to the mouth of one tube for a few seconds. It is then deadened somewhat, but not wholly, by touch. The ear on that side then fails to catch the weak sound, but if the fork be brought to the other tube the sound is heard distinctly. The fatigue passes off in two to five seconds. A weaker tone of different pitch from the strong one is heard equally with both ears. Again, the same author has experimented with regard to subjective sensations of sound occurring after a strong tone has been heard for a little. The after sensation may come close upon the other, or be separated from it by a short pause. In the latter case (the only one studied as yet by the author) the pause varies up to fifteen seconds; then the sensation is revived, generally for five to ten seconds, then a pause and a renewal of the sensation, etc. Some persons have only one after sensation, while others have as many as six or eight. The time thus occupied (from cessation of the objective tone) is seldom over two minutes. A correspondent of the Cleveland (Ohio) *Leader* has described some experiences of his own in hearing, which remind one of color blindness. Certain sounds he never hears—*e. g.*, the song of birds. A room might be full of canary birds all singing, but he would never hear a note, though he would hear the fluttering of their wings. Nor does he hear the hissing sound of the human voice. He was taught to make it, and he never makes it without effort. About a quarter of the sounds of the human voice he fails to hear; and he has to be guided a good deal by the motion of the lips and the sense of remarks made. The upper notes of musical instruments he misses, but he hears the lower ones. In the Pennsylvania Medical Society, once more, Dr. Turnbull has recently called attention to the danger to life and property arising from deafness on the part of railway men, a considerable minority of whom have ear affections resulting from the conditions of their work. After citing personal observations and the evidence collected by Moon and Hirt, he recommended that all candidates for railway service should be carefully tested as to hearing by the company's physician, who should also report to the superintendent each case of deafness discovered in locomotive men, so that they might be transferred to positions where perfect hearing is less important.

Prophylactic Inoculation of Germs.

Prophylactic inoculation, which has been so carefully investigated in France, was the subject of communication by Grawitz to the recent Surgical Congress at Berlin, which dwelt also with the question of the transformation of innocent into deleterious organisms. Fungi which grow in bread, milk, etc., develop in an acid medium and at the ordinary temperature. Inoculated in an animal, they rapidly die, being in uncongenial conditions; but by successive systematic cultivation Grawitz has succeeded in acclimatizing the fungi in a medium, such as the blood, of a decided alkaline reaction, and at a temperature of 37° C. They are found to have then become infectious germs, the degree of their deleterious action being proportioned to their power of adaptation to their new conditions of existence.

Inoculating rabbits with the products of cultures more and more perfect, Grawitz has noted a progressive increase, not only in the intensity of the disorders thus produced, but also in the localization of the local lesions. As soon as the spores are sufficiently adapted to the conditions of the blood, they become established in the kidneys and in the liver, accumulating in foci, and causing swelling of the organ, and fatty degeneration of the cells. With still more highly developed products of culture, colonies of parasites are met with in the muscles, then in the intestines, in the spleen, and, finally, in the brain and lungs. Grawitz, like the French observers, has also found that the inoculation either of large doses of fungi of low "culture," or of smaller quantities of the organisms which have acquired more deleterious properties, will confer an immunity against future more virulent inoculations. Inoculation with uncultivated spores, not suited to the animal organism, confers no immunity.

Grawitz attempts to explain these facts by the following theory. The organs are invaded by colonies of organisms, in the order of the functional activity of their cells, taking as the measure of that activity the consumption of oxygen in a given time. He speculates that the germs in contact with the anatomical elements of the organism attack first those which have the least vital power of resistance, and somewhat fancifully suggests that the tissue elements, if successful in the struggle, acquire an increased power of resistance, which they transmit to their successors.—*Lancet.*

The Phylloxera in France.

Mr. C. H. Perceval, H. M. Consul at Bordeaux, reports as follows:

"The information which I have gathered on this subject, from official and other sources, tends to reduce the methods used to the following three: First, submersion of the vineyard, when practicable; secondly, by employing insecticides; and, thirdly, where the vineyards have been destroyed, by the plantation of American varieties of vines, whose roots offer more resistance to the attack of the insect. M. Armand Lalande, the President of the Chamber of Commerce of Bordeaux, proprietor of extensive vineyards in the Médoc, a gentleman to whom I am much indebted for the information and assistance which he has been kind enough to afford me in drawing up this report, addressed a meeting of that body held in March last on various topics, and I translate the following from his remarks regarding the phylloxera: 'The Chamber of Commerce has not ceased to show the extreme importance which it attaches to all the means employable in combating this dreadful scourge. Of the 2,200,000 hectares which composed the vineyards of France, 500,000 are destroyed, 500,000 others are greatly attacked; it is a loss of more than three milliards to the country. The Gironde is one of the departments which has suffered most; one third of the vineyards are destroyed, another third is badly attacked. We must admit, with sorrow, that the very sources of our commerce and of the well being of our southern population are most seriously compromised. Still we have great hopes that, by energetic and intelligent efforts, we may be enabled gradually to arrest and repair the evil. For the very important vineyards of the Gironde, where submersion is possible, it is a sure remedy, which is generally employed, and with invariable success. In the cases of vineyards already destroyed, the remedy seems to be to reconstitute them by planting American vines as stocks for grafting French cuttings on, which plan has been the subject of satisfactory and conclusive experiments for the last few years, especially in Languedoc. Where the vines are not too far gone, a judicious use of sulphur of carbon is a certain means of preservation, and, in most cases, practicable, owing to the moderation of the cost.'"

The Mississippi and Tributaries.

A pamphlet on the Mississippi River and its tributaries gives the following statement of the mileage of the navigable portion of each of the following-named rivers above its mouth: Missouri, 3,129; Mississippi, 2,161; Ohio, 1,021; Red, 986; Arkansas, 884; White, 779; Tennessee, 789; Cumberland, 900; Yellowstone, 474; Ouachita, 384; Wabash, 365; Allegheny, 325; Osage, 363; Minnesota, 295; Sunflower, 271; Illinois, 270; Yazco, 226; Black (Ark.), 112; Green, 200; St. Francis, 180 Tallahatchie, 175; Wisconsin, 160; Deer Creek, 116; Tensas, 112; Monongahela, 110; Kentucky, 105; Bartholomew, 100; Kanawha, 94; Muskingum, 94; Chippewa, 90; Iowa, 80; Big Hatchie, 75; St. Croix, 65; Rock, 65; Black (La.), 61; Macon, 60; Bœuf, 53; Big Horn, 50; Clinton, 50; Little Red, 49; Big Cypress and Lake, 44; Big Black, 35; Dauchitte, 33. Total number of rivers, 33; total number of miles of navigation at present, 15,710.

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A Balloon Experiment.

After waiting several days for favorable weather, Prof. King's balloon, "Great Northwest," was started on its way to the East from Minneapolis, Minn., September 12. Prof. King was accompanied by Mr. Upton, of the Signal Service, and five newspaper correspondents. The balloon rose about 3,000 feet, and drifted slowly in a southeasterly course. It dropped near Fort Snelling, and nearly fell into the Mississippi River. A liberal discharge of ballast secured another ascent, but a brief one, and the balloon came to ground in the woods near St. Paul. When the wind rose it was deemed too violent, and the project was abandoned.

Passenger Birds.

According to a writer in *Nature*, the small migratory birds that are unable to perform the flight of 350 miles across the Mediterranean Sea are carried across on the backs of cranes. In the autumn many flocks of cranes may be seen coming from the north, with the first cold blast from that quarter, flying low, and uttering a peculiar cry, as if of alarm, as they circle over the cultivated plains. Little birds of every species may be seen flying up to them, while the twittering songs of those already comfortably settled upon their backs may be distinctly heard. But for this kind provision of nature, numerous varieties of small birds would become extinct in northern countries, as the cold winters would kill them.

Natural Gas in Iron Works.

A correspondent of a Pennsylvania paper thus describes the use of natural gas in the Kittanning (Pa.) Iron Works. The gas is brought from a well some three miles distant, in four inch casing, and at the mill is distributed among eighteen boiling furnaces. The furnaces are the same as those in which coal is used. The gas enters the rear of the furnaces in three small pipes, shaped at the end like a nozzle. There being quite a pressure, the gas enters with considerable force, and by means of dampers to regulate the draught, an intense and uniform heat is obtained. After a heat the furnace is cooled and prepared for the next heat, in the same manner as with coal. When the metal is in place the gas is turned on, and the operation of puddling is the same with the exception that it is somewhat slower.

The puddlers like the gas very much, as it reduces their labor to some extent, and they say they can make better weight than with coal. The furnaces being free from sulphur, a better quality of iron is produced, and it brings a slightly advanced price in the market. These furnaces have been running all the time for some months past, and have used nothing but gas for fuel, which has proved satisfactory in every respect, is found to be much cheaper than coal, and has demonstrated the fact that this vast amount of natural gas, now going to waste, might be used in all our iron manufactories.

Mr. R. L. Brown, having purchased another and larger well, has organized a stock company, and is about negotiating for the erection of a steel works, to be run with gas. Mr. Brown claims that he has a process by which he can manufacture steel of a superior quality and with less expense than by any process now in use.

Should this latter enterprise prove a success, the same parties who have control of the old Cowanshannock gas well propose to erect glass works, and will apply the gas to the manufacture of glass.

The gas which I have referred to as supplying the boiling furnaces is brought, as I said, a distance of three miles west of Kittanning, in East Franklin township, about ten miles from any oil development, the nearest oil well being at Great Leather. The gas well was put down two or three years ago as a test well for oil on the Reed farm; and was left to burn and go to waste until Major Beale and others bought the well with the idea of making lampblack. But the mill proposed to utilize it for fuel, and it has done so with the most satisfactory results. Only one half of the well's production is in fact consumed by the eighteen furnaces here described.

Notes on Wheel Making.

The first thing that gives way on a buggy is commonly the wheels. I have frequently seen new buggies go out of the shop, and before they had been out a dozen times the spokes would commence to squeak and work in the hub, or one or more of the wheels would dish back. The question then arises, is the woodworker to blame, or is it the carelessness of the smith in setting the tire, or does the fault lie in the selection of the timber used in making the wheels? Let us try and see where the trouble lies.

In the first place, the manufacturer may make a grand mistake in the selection of his timber. Some have an idea that they must have good spokes any way, but are not so particular about the hub or rim; while others must have the hardest hub they can find, saying: "I have got a fine set of hubs, but mixed or forest growth spokes will do well enough." Now we will see how such wheels turn out. We find, after they have been run a short time, that around the mortise of the hub the paint is cracked, the dish is out of the wheel, and the owner of the buggy is mad enough to kill the wheelmaker and blacksmith, and swears he never will pay the balance due on that buggy until he puts on a new set of wheels.

Well, the carriage maker goes to work and puts in a new set of hubs that he happens to have in the shop of much softer timber than the first ones. He thinks these are good enough, but gets the best second-growth spokes he can find. The new wheels are finished, but in a short time they work just the same as the first.

Now the difficulty in the first set was a soft spoke driven in a hub as hard as iron; while, in the second case, a hard spoke was driven into a soft hub. Point first: Care must be taken to have the hub and spoke of the same hardness. Point second: A tolerably good set of wheels can be made out of softer timber, providing this rule is observed.

Next, wheels should be made with the spoke driven straight, and the tenon on the spoke should have but little taper, as by driving spokes like a wedge into a hub they are more liable to work back and get loose.

In regard to the rims, great care should be taken not to have them too long, for this prevents the tire from supporting the wheel.

A great deal has been said in the *Hub* about the proper dish of a wheel, some claiming one-half of an inch, while others claim that one-fourth of an inch is sufficient. A wheel with but little dish looks well to the eye, but my experience has been that three-quarters of an inch is not too much to make a durable wheel. SCOTT SMALLWOOD.

Chicago, July 23, 1881.

Statistics of Cotton.

The report of Census Agent Eugene W. Hilgard, just submitted, shows the acreage and production of cotton by States for the year 1879, as follows:

States.	Acres.	Bales.
Mississippi	2,093,330	955,808
Georgia	2,617,138	814,441
Texas	2,173,732	803,642
Alabama	2,330,086	699,654
Arkansas	1,042,976	608,256
South Carolina	1,364,249	522,544
Louisiana	864,787	508,569
North Carolina	893,153	389,598
Tennessee	722,569	330,644
Florida	245,595	54,997
Missouri	32,711	19,733
Indian Territory	35,000	17,000
Virginia	24,900	11,000
Kentucky	2,667	1,367

The average product per acre in pounds was:

States.	Seed Cotton.	Lint.	Cotton Seed.
Mississippi	651	217	434
Georgia	444	148	296
Texas	528	176	352
Alabama	429	143	286
Arkansas	831	277	554
South Carolina	546	182	364
Louisiana	837	279	558
North Carolina	621	207	414
Tennessee	651	217	434
Florida	318	106	212
Missouri	861	287	574
Indian Territory	693	231	462
Virginia	654	218	436
Kentucky	729	243	486

Rain in the United States.

Mr. Henry Gannett, geographer of the tenth census, has issued a report showing the distribution of rain-fall throughout the United States and the distribution of population according to rain-fall. It appears that the highest annual rain-fall in the country has been 150 inches, which was reached for one year only in Puget Sound. The average annual fall upon the surface of the United States, exclusive of Alaska, was, in 1880, 29 inches. This average implies a large area unfit for the purposes of vegetation, which with the rapid evaporation that occurs on this continent, requires a much higher ratio of moisture. Hence, population is found to center principally on such parts of our surface as have from 35 to 50 inches of rain. The following table from Mr. Gannett's compilations will show the relation between rain-fall and number and density of population in the United States in 1880:

Inches of Rain-fall.	Population.	Pop. per Sqr. Mile.	Percentage of total Population.
60 and above	855,680	12·4	1·70
55–60	2,813,866	19·7	5·61
50–55	4,311,502	22·1	8·60
45–50	12,754,479	57·7	25·43
40–45	11,357,292	40·1	22·65
35–40	10,057,170	38·6	20·05
30–35	4,993,336	23·0	9·96
25–30	1,179,136	8·7	2·35
20–25	829,340	3·8	1·65
15–20	537,323	1·3	1·07
10–15	309,438	0·6	1·62
Below 10	154,304	0·6	0·81

The heaviest population is in the classes between 35 to 50 inches, which comprise $71\frac{69}{100}$ per cent of the total population of the country, while the classes between 30 and 60 inches comprise $92\frac{8}{10}$ per cent of the population. The densest settlement is in the class 45 to 50, which also contains the greatest absolute population. In this class also is the greatest absolute increase in density. A rain-fall of 45 to 50 appears to best suit the purposes of wealth-making; for a larger number of our people have settled within an area having that fall than in any other. From the data above given, we reckon that the total rain-fall in the United States, exclusive of Alaska, in 1880, was 414.999,040,307,660,000 cubic inches, or 1,796,532,642,000,000 gallons, which is about double the water contents of Lake Erie and Lake Ontario combined, these lakes containing 893,158,008,000,000 gallons. This will afford some idea of the extent of the evaporation effected on our 3,026,494 square miles of surface within twelve months.

MECHANICAL INVENTIONS.

An improvement in pistons has been patented by Mr. Henry Waterman, of Brooklyn, N. Y. This improvement relates to pistons having their main portions formed by expansible rings carried by a central hub and face plates. The invention consists in the combination, with these essential portions, of devices that give solid and adjustable backing to the rings; also, in a metallic packing disk for the joint between the face plate and rings.

Mr. William P. Brosius, of Richmond, Va., has patented a seam gauge for determining the amount of lap in sewing together two pieces of leather in the manufacture of boots and shoes, or in connecting parts of any other material, so that a uniform amount of lap is preserved and the line of stitching kept at the proper distance from and in parallel position with the edge. It is an improvement in that form of gauge in which a guide face is arranged to rest in the plane of one of the sections of work and bear against its edge, and a second guide face is arranged in the plane of the other sections of the work and is arranged to bear against the other edge, and the distance between which two faces may be varied to regulate the width of the lap.

An improved nut lock has been patented by Mr. John B. Abernathy, of Covington, Ky. The invention consists in a nut provided with a threaded central recess or cavity in its upper surface to receive a central threaded projection of a second nut, which is screwed on the bolt after the first nut, the threads of the projection taking in those of the cavity, thus uniting the two nuts.

Mr. Samuel W. Evans, of New Orleans, La., has patented an improved apparatus for holding a hose nozzle in any position, thereby enabling a person to direct a stream of water in any desired direction. The invention consists in a ring or sleeve for receiving the nozzle, and provided with trunnions journaled in uprights of a plate swiveled on an upright pivoted to a folding base frame, provided on the under side with spikes to prevent it from slipping.

Gelatine Emulsion.

Mr. A. L. Henderson, of London, lately gave a demonstration of the method of preparing a gelatino-bromide emulsion he has for some time past been working with great success. The following is his formula and method of working:

Make a solution of 200 grains of silver nitrate in 4 ounces of water, then add sufficient ammonia to redissolve the precipitate thus formed (about $2\frac{1}{2}$ drachms of ammonia are requisite for this purpose). This solution of ammonia nitrate of silver is now heated to about 100° Fah., and the following solution, also heated to about the same temperature, is poured slowly into it (the mixture being stirred with a glass rod meanwhile): Gelatine, ½ ounce; ammonia-bromide, 150 grains; ammonia, 2 drops; water, 4 ounces.

The emulsion is now cooled as rapidly as possible, and then forced through a fine gauze disk, and washed by means of a stream of water. The emulsion thus obtained is of a grayish-blue tint, of a very fine grain, and extremely sensitive. The rapidity is increased in the same proportion as the silver nitrate is converted into ammonia nitrate, thus (for example), if 20 per cent only is converted into ammonia nitrate, the plate will not be nearly as rapid as if the whole, or nearly the whole, of the silver is converted.

Another important point in this process is that the bromide of silver is formed in an excess of silver, thereby giving greater rapidity and density.

This emulsion is so rapid that even an Edwards lamp with a ruby chimney (that will stand the spectroscopic test) and two thicknesses of ruby paper is not too safe a light.

The emulsion may be converted into pellicle by pouring it slowly (after washing) into three times its bulk of alcohol, stirring meantime. The precipitated emulsion will cling round the rod in a spongy form, but by a little working with the hand the whole will be reduced to the size of a walnut, It must then be torn into small pieces and dried in a current of air. The weight of this quantity, when thoroughly dried, will be about 6 drachms.

This pellicle will keep an indefinite time, and when wanted for use has only to be redissolved in 10 to 12 ounces of water, and strained, when it is ready for coating.

Photo Substitute for Glass.

Professor Stebbing, of Paris, has made a new film substitute for glass plates, which has been laid before the French Photographic Society. The basis of the support is gelatine, rendered insoluble, and the tissue is of such thickness as to be easily handled even when wet, without the slightest danger of injury. It is pliable and "leathery" in its character, thus obviating any tendency to fracture from accidental bending as would be the case possibly if the gelatine were more brittle. The development of these film negatives is extremely simple. It is first of all necessary to take means to prevent the developing solution from passing between the sensitive film and the support. This is effected by drawing the edges of the undeveloped tissue between the thumb and forefinger, which have been previously slightly greased with tallow. The film is then laid in a dish and developed in the ordinary way. When the action of the developer is complete the solution is poured off and the negative washed while still in the dish; in fact, the whole of the operations are performed in the one dish, so that the film is submitted to as little handling as possible. After a short immersion in chrome alum the negative is finally washed and spread upon a sheet of glass to dry. Here the great difficulty previously experienced in getting the films to dry flat has been

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overcome by Mr. Stebbing in a very simple way. When the film negative has been laid smoothly upon the glass a narrow strip of gummed paper is laid along each edge, attaching it firmly to the glass, so that when dry it is stretched perfectly tight; the paper can then be cut and the negative detached.

Fire Risk from Spontaneous Combustion.—An Invention Wanted.

The President of the Boston Manufacturers' Mutual Fire Insurance Company, Mr. Edward Atkinson, states in a recent circular to millowners that since the beginning of 1878 the several mutual companies have lost over $300,000 from fires in dry-houses or finishing departments of print works, all caused by the spontaneous combustion of dyed cotton goods or yarn. The loss to the millowners must have been much greater, since, as in the recent fire in the finishing and packing department of the Slater Mills, a comparatively small fire may seriously interrupt the business of a large establishment. Within the period mentioned there were nine other fires from spontaneous combustion of dyed goods, which were extinguished with little or no loss. All the fires of this class occurred in the night or in the early morning before bell-time. In several cases the watchman passed the points where the fires originated a little before the outbreak, and perceived no smell or other sign of fire. In one case a watchman entered a room in which there was a pile of dyed yarn upon the floor. There was no smoke or other sign of fire; but as the watchman approached the yarn it burst into flames. The movement of the air, or the influx of fresh air when the door was opened, probably supplied the oxygen needed for rapid combustion.

According to a report of the Massachusetts State Assayer, Mr. S. Dana Hayes, to whom the question of the origin of such fires was submitted, there are several colors produced in calico print-works and in dye-houses which are sources of danger from combustion, and which should be most carefully made and controlled. They are the colors developed, after the materials have been applied to the cloth or yarn, by chemical reactions in the tissues, with the production of heat, and also by the aid of heat applied to the fabrics in the aging boxes and chambers.

The development of these colors is believed to be obtained by oxidation—by the union of oxygen, derived from the atmosphere or from oxidizing ingredients of the color-mixture, with the coloring matter itself, on the cloth—in much the same way that the oxygen of the air unites with linseed-oil, when exposed upon rags or other porous materials, producing heat and "spontaneous" combustion. That dangerous chemical action goes on is proved by the increase of temperature, and, in the case of developing colors, by the disengagement of acetic acid and other vapors.

The color dyes in the aging of which heat is developed to a degree making combustion liable are: black made from aniline or its salts, and even in logwood and iron blacks; browns made from catechu, cutch, gambier, or terra japonica; iron buffs; indigo blue; and in preparing cloth with oil for Turkey red.

These colors are produced by oxidation, and are therefore dangerous.

They may cause fires, and they often weaken fabrics unless the aging process is carefully watched.

The most effective means of preventing loss from fires spontaneously generated have proved to be automatic sprinklers and plastering overhead on wire lathing with the covering of exposed woodwork with tin. To prevent the loss incident to the injury of goods by over-heating is not so easy. The insurance company named above are convinced that the problems involved must be reinvestigated in a complete and systematic manner before any hope can be reasonably entertained of economically preventing the risks and difficulties now encountered.

To further such investigations they have engaged a graduate of the Massachusetts Institute of Technology, who, under the supervision of Prof. John M. Ordway, will make a special study of the processes now in use to see if some general principles or methods cannot be determined of wider application than any now controlling the common practice.

The main fault in the usual methods of drying yarns, Mr. Atkinson believes to be that "no consideration has been given to the fact that *air* is merely an *instrument* which may be used to take up moisture from the goods and carry it somewhere else; or that its power is greater or less, as such an instrument, not only in proportion to the heat imparted to it, but in some measure in proportion to the removal of the moisture already in it, before it is used."

It seems scarcely credible that this obvious truth has been so largely overlooked as Mr. Atkinson asserts; in other words, that practical men would expect to dry yarn in air already saturated, however hot.

But facts are stubborn things, and facts like the following are significant. Mr. Atkinson says:

"In one case the air intended to be used for drying purposes has been taken from a wet scouring-room, where it had already become saturated with moisture, and could only become a suitable instrument to take up more by being heated to excess. In another case, the same air has been kept in circulation at a very high degree of heat, with no ventilation, and no chance for fresh air to come into the room except through cracks. In this case, the only deposition of moisture of any great moment must have been at night, when the room became cooler."

Mr. Atkinson states as a well ascertained fact that if drying can be compassed at a degree of heat less than 120° Fah. no injury will be done either to the stock of cotton or wool; but if a degree of heat greater than 120° is used, the fibers are more or less baked and the yarn made harsh and brittle. Most of the drying of dyed cotton and dyed yarn is now done at a higher temperature than 120°, and it is commonly held that a less heat would not dry with sufficient rapidity.

There is obviously an opportunity here for a profitable invention by means of which yarn can be dried at a low temperature, and the heat developed in the oxidation of dyes in yarns and fabrics carried off so rapidly as to obviate the risk both of spontaneous combustion and the injury of fabrics by internal heating. Our inventive readers will do well to think of it. Meantime it is to be hoped that managers of print-works will further wherever possible the investigation which the insurance company's expert is making. Prof. Ordway's report of results cannot fail to be valuable.

Spontaneous Forests.

A writer in a West Virginia paper combats the opinion, held by many arboriculturists, that an open country is never converted into a forest through the operation of natural causes, and, as establishing the fact that such change does sometimes occur, brings forward the case of the Shenandoah Valley. When first settled, about 160 years ago, it was an open prairie-like region covered with tall grass, on which fed herds of deer, buffalo, elk, etc., and having no timber, except on ridgy portions of it; but in consequence of its settlement, the annual fires were prevented, and trees sprang up almost as thickly and regularly as if seed had been planted. These forests, having been preserved by the farmers, cover now a large part of the surface with hard wood trees of superior excellence. These facts would also seem to substantiate the theory that the treeless character of the prairies of the West is due to the annual burning of the grass by the Indians.

Boil Doubtful Milk.

It is with the following words that Dr. Pichon closes his account of the epizootic of 1879–80: "Most authors are silent as to the quality of the milk yielded by cattle during the prevalence of epizootics. It is possible that experience has not as yet supplied sufficient ground for its condemnation, and it is true that while a diminution of milk secretion is usually an early symptom in almost all diseases of the cow, complete suppression of that secretion accompanies any aggravation or prolongation of disease. The source of danger is thus removed by the operation of natural causes, and the discussion is narrowed to the question whether milk secreted at the very onset may not have acquired hurtful properties. In this state of uncertainty, which has not been cleared up by any authority on hygiene, the precaution of boiling the milk should be adopted. Boiling destroys any infective germs that it may contain."

How Our Fresh Meat is Handled.

A prominent dealer in live stock gives the *Tribune* the following facts and figures relative to the trade in cattle, sheep, and hogs in and around this city:

The cattle come to Jersey City mostly by the Pennsylvania Railroad, which brings the cattle shipped by the Baltimore and Ohio from Southern points. Many also come by the Erie Road. The majority are shipped from Chicago, St. Louis, and Cincinnati, by dealers in those places who are either interested with the sellers in New York or have their stock sold on commission, the charge for which is generally $1.50 per head. The best bullocks for beef come at this time of year from Ohio and Kentucky, and in the winter from Illinois and Missouri.

The breeds are usually natives or grade Shorthorns and Durhams. Illinois, Iowa, Missouri, and Kansas are the States where the most corn is fed to bullocks, and the stock from those States, therefore, makes superior beef. A great many beeves are coming from the plains of Colorado, and are very fair stock. About 40 per cent. of the arrivals at this time of the year are Texans and Colorado half-breeds. They are composed in a great measure of bone and horn, and usually bring very low prices. As the country is more thickly settled the Texas cattle become tamer and easier to handle, but they are still the subject of a few stray "cuss words" from drovers and butchers.

The Cherokee cattle raised by the Indians are much like the Texans, only smaller and neater. Some dealers buy the Texas cattle and fatten them on corn in Illinois, Kansas, and Missouri, and so make fair beef of them. Others, in Cincinnati, Chicago, Sterling, and Peoria, Ill., and Cynthiana, Ky., fat many Texas steers on distillery refuse or "slops"—the grain after it has been distilled. This feed makes healthy meat of fair quality. Some say, however, that the meat of this kind is softer and more flabby, and that a distillery-fed animal will die in very warm weather, when a corn-fed one will be in good condition.

The cattle-growing part of the country has moved West rapidly in the last few years, as the new States have been opened up, until now the most of the stock coming to this market is raised west of the Mississippi. Kansas, Nebraska, Colorado, Iowa, and Missouri have taken the business from Ohio, Indiana, and Illinois, and many farmers in the latter States are turning their attention to raising sheep and hogs as more profitable. Chicago is the great cattle depot of the country, and handles about 30,000 head a week, while New York's average was, last year, 13,018. But Chicago is a distributing point, while New York is a market. New York eats most of the live stock she receives, while Chicago has much more than she can masticate, and so sends it away.

Live stock usually stops over several hours in Chicago, and is again unloaded, watered, and fed at Pittsburg, or some other point on the way to New York. The trains arrive at Jersey City at all hours of the night. The cars are open or "slatted," and the animals are found to ride best put in loose with no stalls. Extra floors are put in for sheep and hogs. The cars hold fifteen to nineteen native bullocks or twenty to twenty-five Texans. The arrivals are nearly a hundred and fifty cars daily.

At daylight the sales begin and last till about 12 o'clock. The buyers are wholesale slaughterers and shippers. These glance through the yard, look at the bulletin of animals, and then begin to bargain for some lot of cattle which has struck their fancy. If the supply is small, however, they will not bargain long, for fear a rival may step in and "leave them in the cold." There are three market days at the cattle yards—Monday, Wednesday, and Friday—Monday being the principal one. At one time Sunday was the principal day for selling cattle. When a slaughterer has selected his cattle they are driven up to the scales, on which about forty can be weighed at once.

A well-fatted native steer will weigh from 1,200 to 1,500 pounds; occasionally they go as high as 2,500 pounds. The dealers in New York have a curious way of selling bullocks, which is different from any other market, and as unique in its way as the tenaciousness with which the New York potato dealers cling to the "York shilling" in their business. A bullock is sold at its dress weight before it is dressed—that is, a lean animal would be estimated to dress fifty-three to fifty-five pounds a hundred, a good one fifty-six to fifty-nine, and fancy ones sixty to sixty-two pounds. Thus, for every hundred pounds of live weight the price per pound of dressed beef is charged on the number of pounds the animal is estimated to dress a hundred.

The Jersey City Stock Yards are owned by the Central Stock and Transit Company, and they are a heavy-paying investment. The charge for every head of cattle coming to the yard is 45 cents, called "yardage," and this pays for very little more accommodations than a railroad company usually furnishes for nothing in the shape of depots. The company also charges $2.50 per hundred for hay, an outrageous price, but one which the cattle men are compelled to pay. The charges are about as heavy at the other principal market of this city, the Sixtieth-street yards, the two being virtually under the same management. The Sixtieth-street yards accommodate particularly the stock coming over the New York Central and Erie railroads, and nearly as many cattle arrive there as at the Jersey City yards. The method of handling and selling is the same.

The hog yards for the New York Central Railroad are situated at Fortieth street and Eleventh avenue, where about 10,000 hogs are now arriving and being slaughtered every week. New pens for the brutes are building, which will lessen the inevitable smell from the swine. They are shipped mainly from Chicago, which now far eclipses Cincinnati in its hog traffic, and which handles from 100,000 a week in summer to 50,000 and 60,000 a day in winter.

The supply of sheep is divided about equally between Jersey City and Sixtieth street. They are shipped largely from Ohio, Indiana, and New York. Lambs now are arriving mainly from Kentucky and Virginia, and they later will come from New York State and Canada. The stock yards around New York have changed a great deal in the past few years, the old ones at Communipaw, Weehawken, and other points being discontinued, until they have narrowed down to three large yards, one of which—Fortieth street—is solely for swine.

To Remove Ink Stains.

The *Journal de Pharmacie d'Anvers* recommends pyrophosphate of soda for the removal of ink stains. This salt does not injure vegetable fiber and yields colorless compounds with the ferric oxide of the ink. It is best to first apply tallow to the ink spot, then wash in a solution of pyrophosphate until both tallow and ink have disappeared.

Stains of red aniline ink may be removed by moistening the spot with strong alcohol acidulated with nitric acid. Unless the stain is produced by eosine, it disappears without difficulty. Paper is hardly affected by the process; still it is always advisable to make a blank experiment first.

Pearl Hunting in Tennessee.

The search for pearls in the mussels of Ohio has been a considerable industry for years. The Nashville *American* reports an outbreak of pearl hunting in Stones River, Rutherford County, Tennessee. Not less than 500 people were engaged daily in raking the bottom of that stream, delving down in the mud for mussels, which are piled along the banks, opened, and critically examined for the treasures contained in many of them. One pearl is reported for which $80 was paid in New York. The general range of value, however, is said to be from 50 cents to $25.

A Shoe Black Plant.

The "shoe-black plant" is the popular name of the *Hibiscus rosa sinensis* in New South Wales. Its showy scarlet flowers contain a mucilaginous juice which gives a glossy finish to leather. The plant grows freely in almost any kind of soil, and the flowers are much used when dry as a substitute for shoe-blacking. They may be used with or without a brush.

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Mr. H. P. Feister, the well known mechanical engineer, has resigned the superintendence of the machine works of Messrs. Rex & Bockius, of Philadelphia, and assumed the superintendence and general management of the Franklin Machine Works. R. S. Menamin proprietor, 517 to 521 Minor street, Philadelphia. Mr. Feister still continues designing and constructing special machinery for various purposes.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Draughtsman's Sensitive Paper. T. H. McCollin, Phila., Pa.

Electric Lights.—Thomson Houston System of the Arc type. Estimates given and contracts made. 631 Arch, Phil.

Paragon School Desk Extension Slides. See adv. p. 204.

Foot Lathes, Fret Saws, 6c. 90 pp. E. Brown, Lowell, Mass.

Wanted—Two First-class Machinists. Address W. W. Oliver, Buffalo, N. Y.

Common Sense Dry Kiln. Adapted to drying all kinds of material where kiln, etc., drying houses are used. See p. 205.

Small Machine Shop for Sale. Established 1873. List free. E. Side, 370 S. First St., Brooklyn, E. D., N. Y.

For Sale.—Fast 42 foot Propeller Yacht and 50 foot Side-wheeler. S. E. Harthan, Worcester, Mass.

The advertiser, an electrician, experienced in the practical construction of electrical instruments, wishes a situation. Moderate salary expected. Address Electrical Worker, Box 773, New York.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Alden Crushers. Westinghouse Mach. Co., Pittsb'g, Pa.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Punching Presses & Shears for Metal-workers, Power Drill Presses, $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N. Y.

Improved Skinner Portable Engines. Erie, Pa.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

For Machinists' Tools, see Whitcomb's adv., p. 173.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Peck's Patent Drop Press. See adv., page 204.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

4 to 40 H. P. Steam Engines. See adv. p. 189.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited. Erie, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N. Y.

Cope & Maxwell M'f'g Co.'s Pump adv., page 189.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

The I. B. Davis Patent Feed Pump. See adv., p. 205.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss. Brooklyn, N. Y.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 157.

The Sweetland Chuck. See illus. adv., p. 172.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor. Stiles & Co., Riegelsville, N. J.

Skinner's Chuck. Universal, and Eccentric. See p. 173.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Ball's Variable Cut-off Engine. See adv., page 204.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares, notions, and novelties in the above line, a specialty. See advertisement on page 204.

Leather Belting, Rubber Belting, Packing and Hose Manufacturers' Supplies. Greene, Tweed & Co., N. Y.

Brass & Copper in sheets, wire & blanks. See ad. p. 204.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Clark & Heald Machine Co. See adv., p. 206.

Blake's Belt Studs. The best fastening for leather and rubber belts. Greene, Tweed & Co., 118 Chambers St., N. Y.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 204.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

Wren's Patent Grate-Bar. See adv. page 205.

Use the Vacuum Oils. The best cylinder lubricating, engine, and cylinder oils made. Address Vacuum Oil Co., No. 3 Rochester Savings Bank, Rochester, N. Y.

Supplee Steam Engine. See adv. p. 204.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Eagle Anvils, 10 cents per pound. Fully warranted.

Geiser's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Geiser M'f'g Co., Waynesboro, Pa.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 205.

New Economizer Portable Engine. See illus. adv. p. 205.

Renshaw's Ratchet for Square and Taper Shank Drills. The Pratt & Whitney Co., Hartford, Conn.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 206.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Saw Mill Machinery. Stearns Mfg. Co. See p. 205.

For the best Diamond Drill Machines, address M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 222.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) M. Z. asks: Can you please tell me through your valuable paper the greatest number of tons that ever an ocean steamship carried, and what is the name of the same? A. The Great Eastern had the greatest tonnage capacity, but we do not know the greatest tonnage she has actually carried.

(2) A. R. M. asks for a simple method of testing and assaying silver ores. A. Charge into a six-ounce crucible (a Battersea F answers very well) one ounce each of the ore and dry bicarbonate of soda, two ounces of litharge (free from silver), half an ounce of argal, and cover with a quarter of an inch of dry salt. Heat the crucible until the contents are in a quiet state of fusion; remove from the fire, cool, break, and clean the lead button by pounding on an anvil. If the button weighs more than, say, half an ounce, scorify it down in a scorifying dish in an open muffle. Heat 1¼ inch bone ash cupel in the muffle, drop into it the button, and keep up the temperature of the muffle to a bright red heat until all the lead has been scorified off and absorbed by the cupel, and the small bead of gold or silver (if the ore contains any) becomes well rounded and clear. The ore must be finely powdered, and the whole of it passed through an eighty-mesh sieve.

(3) A. G. wants to know how to recover silver from old solutions. A. Precipitate the warm solution by addition to it of common salt; allow it to settle, decant the clear liquid, and throw the precipitate together with several scraps of zinc, into warm dilute sulphuric acid. When the chloride is all reduced, pick out the remainder of the zinc, decant and press out the liquid from the precipitate, dry, mix it with a little borax, glass, and powdered resin in a small clay crucible, and heat to complete fusion. Cool and break the crucible; the silver will be found as a button in the bottom. With a small crucible, a good fire in an ordinary cooking stove will answer for the fusion.

(4) E. J. S. asks how to silver plate iron and steel. A. Dissolve 12 oz. cyanide of potassium and 1 oz. (troy) of chloride of silver in 1 gallon soft water; filter, and suspend in this bath the chemically clean work and a plate of pure silver, exposing a surface somewhat larger than that of the work. Connect the work with the negative or zinc pole of a small Daniell or Smee battery of two or three cells by means of a stout copper wire, and join the silver plate in a similar manner with the positive pole of the battery. The work may be prepared for the bath by boiling it in a strong aqueous solution of caustic potassa or soda to remove traces of oil, rinsing in running water and scouring with a brush and pumice powder moistened with strong cyanide of potassium solution; then quickly rinsing again, and without fingering, placing in the bath, and in circuit. A somewhat weaker (in silver) bath, called the "whitening" bath, and a stronger battery, is generally used to whiten or throw on the first film of silver. The proportions for this are: Cyanide of potassium, 1 lb.; chloride of silver, a quarter of an ounce (troy). If the silver runs on dark, use a weaker battery, or break the current so as to give alternate intervals of rest. Thirty minutes ordinarily suffices when a battery of three or four Smee cells, plates 1x4 inches, are used. In the whitening process an additional cell or more is employed. Iron takes silver better after having received a light deposit of copper. The metal must be freed from oxide by pickling in dilute acid and scouring with sand. For coppering a slightly acid bath of the sulphate and a strong battery may be used.

(5) N. W. writes: In building a dry room to dry lumber, is it best to admit the dry air in at the top, and take the moist air out at the bottom of the room, or *vice versa*? is not the moist air the heaviest, and will it not consequently fall? A. Admit the dry air at the bottom. The levity of the moist air will be sufficient to carry it off with a proper flue or chimney.

(6) J. H. asks: What is the best apparatus in use for heating 20 or 30 gallons of water quickly, by gas or oil? A. We think a coil of iron pipe in a furnace alongside your tank, with the water circulating through the coil into the tank.

(7) C. E. B. asks for a cheap preparation that could be applied to strawboard in form of a bath that would prevent dew and rain from injuring berry boxes made of it. A. A dilute solution of shellac in alcohol is the best coating we think of. See article on waterproofing in No. 6, current volume.

(8) A. S. P. asks: What space would a cubic foot of gas (atmospheric pressure) occupy at six atmospheres, and formula for finding above? A. Approximately, the space occupied is inversely as the pressure; or one cubic foot at one atmosphere would occupy one-sixth of a cubic foot at six atmospheres.

(9) E. M. J. asks how to make tracing cloth. A. Wagner's tracing cloth is said to be prepared as follows: Boiled bleached linseed oil, 20 lb.; lead shavings, 1 lb.; zinc oxide, 5 lb.; Venetian turpentine, half a lb.; boil for several hours, then strain, and dissolve in the strained composition 5 lb. white gum copal. Remove from the fire, and when partly cooled add purified oil of turpentine sufficient to bring to the proper consistence. Moisten the cloth thoroughly in benzole, and then give it a flowing coat of the varnish.

(10) A. L. asks: 1. Is asbestos packing for stuffing boxes in general use in the United States? A. Yes. 2. Who are the principal manufacturers? A. See our advertising columns. 3. I am told the raw material comes from Canada. Could you give me the name of the place? A. It comes from mines or quarries on the north side of the Ottawa River.

(11) W. H. F. asks what kind of wood is used in a piano into which the screws for receiving the wires are inserted? Is it one piece, or several layers glued together? Must the screws have a deep cut or a fine one? Which is the best wood for this purpose? A. Use maple wood, with a veneering of the same about three-eighths of an inch thick, glued to the front face, and having the grain at right angle with the back. Your cheapest plan for the screws is to buy them at any piano hardware store ready made.

(12) H. asks: 1. In making the secondary of an intensity coil out of 7 oz. of No. 34 (B & S) gauge silk insulated copper wire, insulated from and wound over a primary, 7 inches long, of No. 14 wire, about what length of spark could I get, using a battery power of six carbon cells? A. Your primary wire is rather coarse. You should use three layers of No. 16. If the coil is properly made and provided with a condenser, you should get a spark one inch long. 2. Could I continue to wind one pound of the fine wire, without changing any of the other conditions of the coil, and get a larger spark? Or what changes would I be obliged to make in the other parts of the coil to meet the added half-pound of induction wire? A. You might increase the quantity of secondary wire with advantage. 3. In making an intensity coil for a large spark, would I have to employ coarser wires and very much increased battery power? A. Yes.

(13) G. E. M. asks how much difference the expansion and contraction of a steel railroad rail makes in its length when in use during an average year in this latitude. A. For difference of extremes in temperature of 130° Fah., will be about one-eighth of an inch in 12 feet, or on a 36 foot bar say three-eighths of an inch.

(14) J. M. K. writes: 1. It is claimed by some that lightning strikes wire fences very easily; if it is so, would not putting in ground wire (connected with all wires and running down into the ground) make a sure remedy? A. A ground wire connected with all of the wires, with its lower end buried in earth that is continually moist, and surrounded by coke or tin scraps to increase its underground conducting surface, would carry off the current. 2. How far should the ground wires be apart? A. About 500 feet. 3. Is copper better for the conducting rods in lightning rods than iron? A. Yes, but iron is cheaper, and if a larger conductor of iron be used, it is just as efficient. 4. Some parts of my portable boiler and engine are run over with waste oil (lard oil) which is burned hard, and I would like to have it removed, as the paint underneath is not spoiled. Can you tell me how to remove it? A. We know of no way of removing the oil without removing the paint underneath it. Better take it all off, and repaint. Make a strong lye, and apply it freely with a swab. It will soften the oil, so that it may be readily removed. 5. Do you think acoustic telephones are good for one to one and a half miles? A. Under favorable circumstances, yes.

(15) W. E. T. asks: 1. What kind of iron is suitable for making the cores of magnets? My manual says soft iron. Does that mean common or refined iron? If not, where can I procure the right kind? A. Common refined iron answers very well if thoroughly annealed. Heat it red hot and bury it in ashes, allowing it to remain until cool. 2. How many feet of wire do I want to make a common magnet, and about what number? A. It depends upon the size of the magnet and the purpose for which it is to be used. For a small magnet for experimental purposes, a core wound with No. 22 wire answers very well. 3. Would silk-covered wire be better than uncovered? A. Yes, it should be silk or cotton covered. 4. How many thicknesses of wire would answer around the cores? A. The thickness of the wire coil may generally be equal to the diameter of the iron core.

(16) J. H. J. asks (1) for directions for making a Leclanche battery. A. Place in a porous cell a rod or plate of carbon, and fill the cell with coarsely powdered black oxide of maganese and clean coke or retort carbon. Seal the cell, leaving two holes for the air to escape when the battery is set up; place the porous cell in a jar containing a saturated solution of sal ammoniac, and place in the sal ammoniac solution a rod of amalgamated zinc. 2. Would Fuller's mercury bichromate battery do for gold or silver plating? A. No: it is not intended for continuous work. See Batteries, in SUPPLEMENT, Nos. 157, 158, and 159.

(17) F. K. asks for the compositions of red brass. A. Red brass—89 parts of copper, 11 parts of zinc. Red bronze—86 parts of copper, 11 parts of zinc, 3 parts of tin.

(18) N. O. M. asks: Is there any resistance to overcome in a dynamo electric machine except that caused by friction? A. Friction is an inconsiderable element in the resistance of a dynamo electric machine. The resistance due to the attractive power of the field magnet exerted on the armature is enormous, and it takes a great deal of power to revolve the armature when the circuit of the machine is closed.

(19) J. D. asks: 1. What is the best polish to use in polishing the inside of gun barrels with? A. Emery flour, with a very little oil, is about as good as anything. 2. What is the best oil to use to prevent gun barrels from rusting? A. Pure sperm, or sperm mixed (by aid of heat) with about three per cent of paraffine wax. 3. What is the best polish for a walnut gun stock? A. Good clear shellac varnish rubbed on with a rag very slightly oiled.

(20) D. N. M. asks: 1. Will the stain recommended for fishing rods, in answer to J. B. A. (4), No. 8, anwer for worn gun stocks? Is the preparation solid or liquid? The stocks are white wood; I want them brown. A. The preparation is liquid, and can be advantageously used for the purpose mentioned. 2. I have found a sort of jelly fish, or *radiata*, in the Ohio, attached to a water-soaked log. The outside is covered with fern-like spines, very clear and about half an inch long. Are these of any value? A. The animal described is common and not valuable.

(21) In answer to the query of S. S., p. 172 (11), current volume about treating over-salted hams, etc., D. N. M. says: "Immerse the hams for about fifteen hours in cold sweetmilk, rinse with water, and sweeten with sugar or sugar curing. Ham or bacon left in milk over night is much improved in taste." C. E. B. says: "Soak the meat twenty-four hours in cold water, then put the pieces down in a barrel, with a weight on top to keep them down, and pour over them a pickle prepared from: Water, 6 gallons; brown sugar, 2 lb.; saltpeter, 4 oz.—boiled together and cooled. Pickle in this four to six days, then take out and smoke."

(22) F. F. J. asks: Can you inform me what substance I can apply to a wooden surface probably best in the form of paint, which, when dry, shall afford a light-colored surface which will allow a pencil mark to be made upon it, and then easily erased by moisture? A. We know of no colorless substance or composition that will satisfactorily answer the requirements. A white tablet surface varnish is prepared by mixing very finely ground clear quartz or glass, with a dilute alcoholic solution of pale shellac. It may be applied as a paint, and dries quickly. A sirupy solution of water glass can be made to take the place of the shellac varnish in the above receipt, but it dries slowly.

(23) J. V. asks: 1. For a covering for steam pipes. A. Hair felt, wool felt, or wool carpets, new or old, make good covering. There are many fancy and patent coverings, but you could not probably get them readily. 2. Also, for scale preventive for boilers. A. We cannot say what you should use without knowing the character of the scale or the water.

(24) N. H. writes: 1. I am thinking of building a steam buggy, and wish to have your opinion on it. I propose to have two horizontal iron tubes about 7 inches diameter for the foundation or reach, one to be a reservoir for water, the other for petroleum, the boiler to be between them, with furnace underneath; the engine (2x3) to be fastened on top of boiler, and all suspended on springs from hind axle, which will be above, and driven by belt or flexible shaft from engine. The buggy will be longer and have lower front wheels than ordinary. 1. Will crude petroleum do for fuel? A. Yes, it can be used successfully. 2. Will it have to be blown in in fine spray? A. The best mode must be determined by experiment. 3. Can a furnace be made to consume the smoke while running? A. Yes, partially. 4. Has any person made a practical steam buggy; if not, is there any reason why one could not be made as suggested. A. Not that we are aware of. We do not know of a successful attempt. The weight of the complete vehicle is a great objection.

(25) J. W. G. writes: I have a three story flouring mill that I wish to warm with the exhaust steam from my engine. Can I do it by running a continuous eight inch galvanized iron pipe through the mill, and would it do for the condensed water to flow back to the heater on the bottom of this pipe? The building is 40x50 feet, 11 foot stones. How many square feet of heating surface would I need? The engine is 16x24, 75 revolutions, slide valve. A. Yes; you can heat the mill in that way. You should apply to some party who is engaged in putting up steam heating apparatus for best arrangement of pipes. To do this properly requires a personal examination of the building and its surroundings.

(26) L. H. asks for a mixture that will, by plunging in, temper a heavy piece of steel of irregular form to the temper of a cold chisel. Said piece will crack when plunged in hot water. A. Try an oil or tallow bath as a first dip, then water.

(27) E. R. asks: 1. In the Holtz machines illustrated in SUPPLEMENT, Nos. 278, 279, are there four paper inductors cut, two being pasted at each aperture in stationary plate on opposite sides of glass? A. There are four inductors, two at each aperture, on opposite sides of the glass. 2. Is the gilt paper pasted on them or on the glass? A. It is pasted on the paper inductors.

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NEW BOOKS AND PUBLICATIONS.

ANNUAL REPORT OF THE DEPARTMENT OF MINES, NEW SOUTH WALES, FOR 1880. Sydney: Thomas Richards, Government Printer. 7s. 6d.

Gives with great fullness of detail the mining operations and discoveries of the year. A valuable geological sketch map accompanies the report. A summary of the mineral products will be shown in another column of this paper. The total value of the gold, silver, coal, shale, tin, copper, iron, antimony, lead, and other less important minerals raised in New South Wales down to the beginning of 1881 was something like $250,000,000. Gold, coal, tin, and copper are the chief minerals.

SPONS' ENCYCLOPÆDIA OF THE INDUSTRIAL ARTS, MANUFACTURES, AND COMMERCIAL PRODUCTS. Edited by G. G. Andre. London and New York: E. & F. N. Spon. In 30 parts. 75 cents each.

Parts 18 to 25 of this encyclopædia cover the subjects Hair and its applications, hats, honey, ice, India-rubber, ink, ivory, jute, knitted fabrics, lace, leather, linen manufactures, manures, matches, mordants, narcotics, nuts, oils and fatty substances, paper, perfumes, photography, photometry, paints and pigments, pottery, etc.

CIRCULARS OF INFORMATION OF THE BUREAU OF EDUCATION. 1881. Washington.

No. 1. "On the Construction of Library Buildings," by William F. Poole. No. 2. "The Relations of Education to Industry," and "Technical Training in American schools," by E. E. White. No. 6. A report on the Teaching of Chemistry and Physics in the United States, by F. W. Clarke. No. 7. Spelling Reform.

[OFFICIAL.]

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[Those marked (r) are reissued patents.]

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Watch cases, J. C. Dueber ... 8,601

English Patents Issued to Americans.

From August 26 to August 30, 1881, inclusive.

Aerial navigation, A. L. Blackman, Nashville, Tenn.
Cooling air, J. P. Burnham *et al.*, Chicago, Ill.
Berth, A. M. Crosby, U. S.
Drilling machine, L. W. Tracy, Philadelphia, Pa.
Drying apparatus, C. H. Hersey *et al.*, Boston, Mass.
Electric light, T. A. Connoly, Washington, D. C.
Electric light regulators, S. J. Burrell, Brooklyn, N. Y.
Locomotive engine, F. M. Stevens *et al.*, Concord, N. H.
Piston rod packing, G. H. Richards, Boston, Mass.
Pocketbook, J. W. Meaker, Auburn, N. Y.
Refrigerating apparatus, H. D. Cogswell, San Fran., Cal.
Ring, spinning machine, S. A. Jenks, Central Falls, R. I.
Steam generator, S. C. Salisbury, New York city.
Water closet, Hartford Sanitary Plumbing Company, Hartford, Conn.
Water meter, W. L. Hunt, New York city.

PATENTS.

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Cut this Ad. out. It appears but once.

GIVE US A TRIAL ORDER.

Cut this Ad. out. It appears but once.

Try Us Once and You Will Always Buy Goods of Us. We are Positively Headquarters. We are Bona Fide Manufacturers and the Largest Manufacturers of Novelty Goods in the United States.

$15,000 Worth of Elegant and Useful Gifts to be Positively Given Away Absolutely Free

TO EVERY ONE WHO WILL SEND US A TRIAL ORDER, large or small, every one having the same chances of receiving a valuable gift if their order is but for a single 10 cent article as they would were it for $100.

THE OBJECT OF THIS ADVERTISEMENT and why we offer these **IMMENSE INDUCEMENTS** is, first, to increase our own business, and second, to make so **GRAND and ADVANTAGEOUS AN OFFER** that every reader of this paper will give us **A TRIAL ORDER,** large or small, and by that means get acquainted with us and our principle of **BEST GOODS, LARGE SALES, and SMALL PROFITS.** Being **BONA FIDE MANUFACTURERS** and importers, and the **LARGEST IN OUR LINE IN THE UNITED STATES,** we propose to sell direct to the consumer and **SAVE THE MULTIFARIOUS PROFITS** of middlemen, which, in many cases, amount to more than the first cost of the goods. Therefore, to get the readers of this paper to see that **MONEY CAN BE MADE** and money saved by buying goods from us, we earnestly invite every reader of this advertisement to give us **A TRIAL ORDER,** no matter how small, and be convinced that we can **SAVE YOU MONEY;** and to make this invitation more earnest, we promise to **GIVE TO YOU** and to every one who sends **A TRIAL ORDER** in answer to this advertisement **AN ELEGANT GIFT ABSOLUTELY FREE.**

WE SHALL GIVE AWAY $15,000 WORTH OF VALUABLE PRESENTS to people who send **TRIAL ORDERS** in answer to this advertisement. **ONE PRESENT POSITIVELY GIVEN WITH EACH TRIAL ORDER,** whether the trial order be for only 10 cents or for more than $100.

THESE GIFTS CONSIST OF SEWING MACHINES, CABINET ORGANS, WATCHES, SOLID GOLD and Plated Rings, Elegant Gold-Plated Sleeve Buttons, Neck Chains, Vest Chains, Ladies' Sets, Coin Silver-Plated Tea, Table, and Dessert Spoons, Casters, Butter Dishes, Coin Silver-Plated Table Knives, Butter Knives, Sugar Shells, China Tea Sets, Dress Patterns, Shirts, Shawls, Ladies' Lace Ties, Photograph and Autograph Albums, Pocketbooks, Toilet Sets, Vases, Pictures, framed and unframed, Gents' Studs, Fine Nickel-Plate Revolvers, Toilet Articles, and hundreds of articles too numerous to mention.

REMEMBER, ALL THE ABOVE ARTICLES TO BE POSITIVELY GIVEN AWAY to persons who shall send us **TRIAL ORDERS** in answer to this advertisement.

ONE PRESENT WITH EACH TRIAL ORDER, whether the trial order be large or small. Remember, a **FAIR FIELD AND NO FAVOR** in the distribution of these gifts. Every one treated alike, whether their trial order be large or small.

HOW THESE ELEGANT GIFTS ARE DISTRIBUTED.

First—Let it be distinctly understood that in the distribution of these splendid presents every one is treated alike, whether the **TRIAL ORDER** is large or small. You will receive the same treatment if your order is 10 cents as you would if it were $100. We will now explain how these gifts are distributed: We have procured a large quantity of long, narrow strips of paper, gummed or coated with mucilage on one side, and on the other side of this paper are written the names of these magnificent gifts that are to be given away as freely as air to every one who sends us a **TRIAL ORDER** in answer to this advertisement. A clerk now takes a package of letters and opens them, and the first **TRIAL ORDER** he comes to (that is sent in answer to this advertisement) he tears off from the top of one of these lists of **BEAUTIFUL PRESENTS** the name of the first article on the list, and sticks it on with the gum on the back to the order. The next **TRIAL ORDER** will have the name of the next order on the list attached to it, and so on. These orders will be handed to the packer, who will pack the articles ordered and also **PACK IN THE GIFT** named on the slip of paper attached. It is thus seen that all have an equal opportunity of obtaining one of the most valuable gifts and a **POSITIVE CERTAINTY** of receiving a splendid present with their **TRIAL ORDER.** Here let us remark, and let it be distinctly understood, that some of the gifts are **WORTH $50.** Many are worth from **$10 TO $20,** others from **$1 TO $5,** and none worth less than from 10 cents to 50 cents, and all we ask you to do to obtain one of these gifts is to send us a **TRIAL ORDER** on any of the goods mentioned below, and see for yourself whether or not we do not give the best value of any house you ever dealt with. Your orders shall receive the same attention, and you shall receive just as elegant and valuable gifts if your order is for 10 cents' worth as you would if for $100.

THIS ADVERTISEMENT is intended to bring the great economic **MONEY-SAVING PRINCIPLE OF BUYING DIRECT** from the manufacturer and importer, and saving the **ENORMOUS PROFITS** of middlemen that sap the life and substance out of the community, and for that reason we wish every merchant and every peddler, every canvasser or agent, and in fact every one who desires to get the **MOST GOODS FOR THE LEAST MONEY** to send us a **TRIAL ORDER,** and we agree not only to give a large value for the money, but a **MAGNIFICENT PRESENT ABSOLUTELY FREE.**

HOW CAN WE AFFORD TO DO THIS?

This question is often asked. In answer we would say, we often spend **THOUSANDS OF DOLLARS** to pay for newspaper advertisements. We can afford to do this because people read the advertisements and send us orders for goods on which we make a profit. Now, by offering these **MAGNIFICENT GIFTS,** we hope to draw the attention of and obtain a **TRIAL ORDER** from every man or woman, rich or poor, who reads this advertisement; and we know that they will be so well satisfied with our goods and prices that we will continue to receive their orders, and on these future orders we depend for **OUR PROFIT.**

REMEMBER, AN ELEGANT AND VALUABLE GIFT TO EVERY ONE WHO FAVORS US WITH A TRIAL ORDER. A fair field and no favor in the distribution of gifts, whether your trial order be large or small.

Below we give **A LIST OF GOODS, EVERY ARTICLE OF WHICH IS A REAL BARGAIN.** Look over the list, select what you want, and give us a **TRIAL ORDER.**

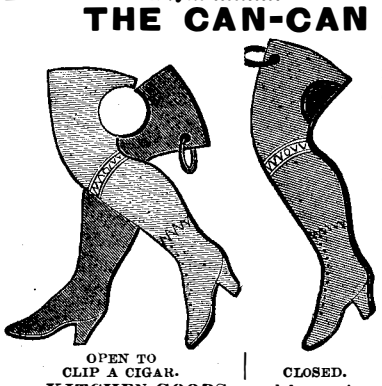
	Sample by mail.	1 doz. by mail.	1 doz. by ex.
Gents' Underwear.			
SHIRTS OR DRAWERS.			
	$ c.	$ c.	$ c.
White or Gray, good	40	3 50	3 00
White or Gray, better	50	4 75	4 00
White or Gray, No. 1	60	5 00	5 50
Overalls and Jumpers.			
Blue Denim	65	6 25	4 50
Heavy Duck	75	7 00	5 50
Cardigan Jackets.			
Cheap	1 00		8 50
Better	1 35		12 50
Fancy	2 25		20 00
All Wool	3 50		32 00
Gents' Fine White Shirts.			
With Cotton Bosoms	75	7 50	6 00
With Linen Bosoms	1 00	9 50	8 00
Very Fine	1 50	13 50	12 00
Overshirts.			
Heavy Cotton	50	5 50	4 50
Fancy Woolen	1 00	10 00	8 00
All Wool Blue Flannel, Single Breasted	1 25	15 00	12 00
Double Breasted	1 75	18 00	15 00
Linen Collars.			
Stand Up, 4-ply	15	1 35	1 10
Stand Up, 4-ply, best	20	1 75	1 40
Turn Down, good	15	1 35	1 10
Turn Down, best	20	1 75	1 40
Linen Cuffs.			
Reversible	25	2 50	2 25
Reversible, better	30	2 85	2 50
Reversible, best	35	3 10	2 75
Neckties.			
Black Bows	10	70	60
Black or Fancy Bows	15	1 10	90
Black or Fancy Bows, better	25	1 50	1 25
Black or Fancy Scarfs	50	3 50	3 00
Black or Fancy Scarfs, best	75	6 00	5 00
Gents' Suspenders.			
Fair Quality	25	1 80	1 50
Better	40	3 00	2 50
Fine Worsted	50	4 50	3 75
Extra Fine and Heavy	65	6 00	5 50

	Sample by mail.	1 doz. by mail.	1 doz. by ex.
Gents' Stockings.			
	$ c.	$ c.	$ c.
Cheap Cotton	10	1 00	75
Fancy	15	1 50	1 25
British	25	2 25	2 00
Woolen	30	3 00	2 60
Heavy Woolen	40	3 75	3 40
Heavy Woole nextra	50	4 75	4 50
LADIES' FURNISHING GOODS.			
Ladies' Hosiery.			
Cotton	10	1 00	75
Cotton, better	15	1 25	1 10
Fancy Repped	25	1 75	1 50
Fancy, extra fine	25	2 25	2 00
Fancy Cotton and Wool	30	2 50	2 25
Wool, new style	40	3 30	3 00
Heavy Merino, white	50	4 50	4 00
Corsets.			
Job	38	3 75	3 00
Good Quality	50	4 50	4 00
Fine	1 00	9 00	8 00
Corset Laces		10	10
Ladies' Lace Ties.			
Assorted Colors	10	75	60
Opera Fringed	10	70	85
Fine White Net, Lace Ends	25	2 25	2 00
Fine Old Gold, Plaited Ends	25	2 25	2 00
Lace Collarettes and Ruches.			
No. 33, Box Plaited	10	60	50
Very Cheap		25	20
No. 120, Marie Stuart Plait	10	50	40
No. 600, Wide Lace Edge	10	50	35
		per box.	per box.
Ruching, 12 yards in a box		50	40
Ruching, 12 yards in a box		75	60
Ruching, Very Fine Lace Finish		1 25	1 00
Handkerchiefs.		1 doz.	1 doz.
Fancy Border		40	35
No. 7, Ladies' colored border, 15 in.	10	60	55
No. 24, Ladies' corded border, 16 in.	10	75	65
No. 8, Gents' Polka dot, 17 in.	15	90	85
No. 35, Gents' corded border	15	1 10	1 00
No. 29, Gents' extra corded colored border	20	1 75	1 65
No. 405, Ladies' Hemstitched	20	1 60	1 50
No. 187, Fine, warranted linen	20	1 35	1 30
Turkey Red, 15 in	10	60	55
Turkey Red, 18 in	10	90	85
Turkey Red, 21 in	15	1 25	1 15

	Sample by mail.	1 doz. by mail.	1 doz. by ex.
Garters.			
	$ c.	$ c.	$ c.
Fulled Elastic Web	10	90	80
Napkins.			
Fancy check, warranted linen		85	75
Fancy check, warranted linen, Extra Large		1 40	1 25
Turkey red damask		75	65
White damask, cut and fringed		80	75
Shoe Laces.			
3-4, per gross		28	18
4-4, per gross		45	35
5-4, per gross		48	35
6-4, per gross		60	40
Worsted Dress Braid.			
All Colors	5	65	60
Tooth Brushes.			
Small Size	10	60	50
Good Selling Article	15	1 10	1 00
Superior Wired	25	2 00	1 80
Autograph Albums.			
Small, 60 page	10	70	60
Lithograph Cover, larger	15	1 25	1 10
Fancy Cover	15	1 10	1 00
Very Fine	50	4 50	4 00
Very Elegant, pure muslin	1 00	9 50	8 00
Large, Fine Leather Covers, Embellished with Designs in Gold Leaf	2 50		24 00

	Sample by mail.	1 doz. by mail.	1 doz. by ex.
Photograph Albums.			
	$ c.	$ c.	$ c.
Fine Gilt and Colored Cover, 12 picture	25	2 00	1 60
Fine Gilt and Colored Cover, 24 picture	50	4 00	3 25
Larger and finer	1 25	15 00	12 00
Very Large and Elegant Albums at $2, $3, $4. and $5 each.			
Pocketbooks.			
No. 200, Small	10	85	75
No. 203, Small with Silvered Chain	10	1 00	85
No. 210, Large, 4 Pocket, Metal Trimmings	10	1 25	1 15
No. 207, Ladies' Size, Fine Leather, Nickel Trimmings	25	2 25	2 00
Old Style Leather Strap Wallet with Bill Holder	25	2 00	1 75
Leather Purse with Clasp	10	80	70
Leather Purse with Clasp, largesize	15	1 25	1 15
Stationery.			
Good Note Paper, per ream			70
Better Note Paper, per ream			85
Best Note Paper, per ream			1 00
Envelopes, per 1,000			1 20
Pipes.			
Bengal Wood Bowl, Nickel Band	10	1 00	80
Bengal Wood Bowl, Nickel Band, cheaper	10	80	65
Assorted Wood, Nickel Trimmed, with Nickel Bowl Cover	20	1 75	1 50
No. 1,211, Brier, straight stem	25	1 60	1 45
No. 539, Brier, curved stem	25	1 60	1 45
No. 7, Brier, Rubber mouthpiece	30	2 00	1 75
No. 35, Meerschaum, curved Cherry stem, Rubber mouth piece	50	4 00	3 75
No. 36, Same as No. 35, only larger	75	6 00	5 50
No. 33, Meerschaum, straight stem, Nickel Trimmings	50	4 00	3 75
A very fine line of real German Meerschaum Pipes in cases in both curved and straight stems at $2.50, $3.50, $5, and $6 each.			
Cigar Holders, Brier	10	80	75
Cigarette Holders, Brier	10	70	65
Cigarette Holders, Meerschaum	25	2 25	2 00
Very fine Meerschaum Cigar Holders in satin-lined cases at $1, $1.50, $2, and $3.			

THE CAN-CAN WATCH CHARM, CIGAR CLIPPER, AND NAIL CLEANER COMBINED.



OPEN TO CLIP A CIGAR. CLOSED.

The cutest novelty that has been seen for years. Youths, men, and every one, smokers and non-smokers, will want one. It is useful and ornamental. Useful, as it saves **BITING** off the end of the cigar, which is not only disagreeable but spoils the teeth. Ornamental, as nothing can be more original or tasty as a Watch Charm. **BEING GOLD-PLATED** it will at once attract the attention of all. Street men, agents, and every wide-awake man or boy will see in this a way to draw in the dimes from the public, and again the old, familiar cry, "Another man made happy," will go forth. Don't delay, but send in your order at once and make your little fortune. Sample by mail, 15 cents; 6 for 50 cents; 1 dozen by mail, 75 cents; 3 dozen, $2; 1 gross by express, $7.

GOSSAMER RUBBER CLOAKS. $18, $21, and $24 per dozen. Samples by mail, $2, $2.25, and $2.50.

GENTS' GOSSAMER RUBBER COATS, $21, $24, and $30 per dozen. Sample coats by mail, $2.25, $2.50, and $3 each.

RUBBER APRONS, not oil cloth, but real Simon Pure black rubber, extra large ladies' size. Sample by mail, 50 cents; one dozen by mail, $3.25; one dozen by express, $2.75. Misses' size, sample by mail, 35 cents; one dozen by mail, $2.75; by express, $2.25.

DRESS SHIELDS for ladies' wear, to prevent perspiration from soiling the dress, causing unpleasant odor. Black, sample pair by mail, 15 cents; one dozen pairs by mail, 75 cents. White, sample by mail, 20 cents; one dozen by mail, $1.25.

GOSSAMER RUBBER SLEEVE PROTECTORS, a marvel of excellence for ladies' wear, as they protect the entire sleeves from becoming soiled by housework. Sample pair by mail, 25 cents; one dozen by mail, $1.65; by express, $1.50; smaller size, $1 per dozen by express, or $1.10 by mail.

LADIES' LARGE SIZE WATERPROOF APRON, sample by mail, 39 cents; one dozen by express, $2.50.

COMMON-SENSE SPECIE POUCH. A common-sense article for agents to sell, and for every one to use. Made of handsome black *Rubber*, gold embossed. When empty, takes up no more room than a dollar bill, and can be distended to hold $50 in specie. Sample by mail, 10 cents; one dozen by mail, 70 cents.

We specially recommend our **HONEST STATIONERY PACKAGE,** because it gives more for the money than can be bought at any store; and the certainty of obtaining AN ELEGANT GIFT that would cost twice as much as the whole package if purchased at a retail jewelry store. Add to this *the chance of obtaining a valuable watch,* are sufficient inducements for any one to buy.

We consider that the following prices are lower than any other house can make on stationery packages of the quality and quantity. Sample by mail, 25 cents; one dozen by express, $1.50; one gross by express, $16.50.

LIGHTNING SELF-SHINING STOVE POLISH. Entirely new, and most wonderful stove polish the world ever saw. No dust, no dirt, no tiresome rubbing; once used people will have no other. Sample box by mail, 10 cents; one dozen by mail, 70 cents; one dozen by express, 50 cents. Don't fail to try this if you want a good selling article.

REVOLVERS, 7-shot, full-nickel plate, handsome, No. 22, $1.25 by mail; $12 per dozen. Cheaper ones for $10.50 per dozen. No. 32, 5 shots, extra heavy; will shoot hard enough to kill a buffalo. Sample by mail, $2.75; $24 per dozen.

KITCHEN GOODS, new labor saving articles, must be seen to be appreciated. Radial Nutmeg Grater. Sample by mail, 10 cents; one dozen by express, 50 cents; 12 dozen, $4. Advance Egg Beater. Sample, 25 cents; one dozen by express, $1.50. Combination Apple Parer, corer, and slicer, warranted to work perfectly. Sample by mail, 30 cents; one dozen by mail, $2; by express, $1.50. Ready Mender for tin ware, with which any housekeeper can mend her own tin ware. Sample, 10 cents; one dozen, 60 cents.

WATCHES AND JEWELRY. Sent by mail, post-paid, on receipt of price. American Stem Winders, open face, nickel case, $4. Swiss Key Winders, open face, $2.50. Aluminum Gold Warranted Timekeepers, $10. Solid Virgin Gold Hunter, cased, $22. Elegant Imitation Gold Trading Watches, equal in appearance to $200 watches, $6 each; six for $30.

SOLID GOLD RINGS, $1. Extra heavy-plated rings, 75 cents; $6 per dozen. Gilt Vest Chains, 25 cents; $4 per dozen. Elegant Plated Vest Chains, $1, $2, and $3 each; half price by the dozen. Plated Sleeve Buttons, 35 cents; $1.75 per dozen. Studs, per set of three, 10, 25, 50, and 75 cents; half price by the dozen.

OUR ILLUSTRATED CATALOGUE describing a large line of agents' goods will be sent to every who sends us a *trial order,* but to no one else, unless green stamp is enclosed. To make it an object for every one to send for catalogue, we shall pack an order *good for* $5 worth of goods in one of every 1,000 catalogues sent out.

READ! READ! READ! READ!

IF YOU WILL GET UP A CLUB among your neighbors and send for $5 worth of goods, we will give you a set of 6 elegant coin silver-plated spoons, and a gift for each member of the club. (*Every member* of club must order a full dozen of goods to get them at dozen prices.) Orders for less than a dozen will be filled only at sample price.

For a club of $10, we will give a solid gold hand ring to the getter up of the club, and a gift to every member of the club.

For a club of $20, a handsome stem winding watch and a gift to each member.

For a club of $50, a very handsome black all-wool cashmere dress pattern, or gent's elegant solid aluminum gold hunter case watch and chain, and a gift to each member.

For a club of $100, we will give either a lady's solid gold watch, or a 4-octave Mason & Hamlin organ, or an elegant sewing machine with magnificent black walnut Mansard top, drop leaf and drawers.

Bear in mind if you get up a club you will still stand the same chance of obtaining a valuable gift that any one does who sends a trial order, and a CERTAINTY of getting the above articles extra to pay for the trouble. Now, if you do not delay, you can take this paper and go around among your neighbors and in half a day get up a $20 club or more. If you wish to try for one of the large clubs you may send in the orders, if you wish, $5 at a time until you get full amount, when we will ship your premium to you.

TO SHOW THAT YOU RUN NO RISK in sending money to us, and that you may know that we are every way a reliable house, we refer you to the Adams, American, or U. S. Express Companies, of Boston, and through them to their agents throughout the country; also to P. M. at City Mills Station (where our factory is located), or to Manufacturers' National Bank, Boston, Mass.

All orders filed the day they are received. Address all orders to

AMERICAN MANUFACTURING CO., 10 and 12 Federal and 76 Milk Street, Boston, Mass.

N. B.—Always send money by registered letter, money order, or bank draft, on New York or Boston, and in answering this always state that you send a *trial order* in answer to this advertisement, otherwise it would be confounded with our regular orders and no *gift* packed.

TAPS & DIES VISES TOOLS TWIST DRILLS CHUCKS MACHINE SCREWS LATHES FILES STEEL STOOL STUBS

TOOLS for Machinists, Carpenters, Amateurs, Jewellers, Model Makers, Blacksmiths, etc. *Send for Catalogue,* and state *what kind* of Tools you require.
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607 Market St., Philadelphia, Pa.

A MECHANIC, WITH TWENTY YEARS' EXPERIence, wishes a partner to go into manufacturing of Thimbles. Box 734, Ansonia, Conn.

Horizontal Steam Engines,

For best Automatic Cut-off or Plain Slide Valve of Superior Design, Complete in Every Respect, ADDRESS
LAMBERTVILLE IRON WORKS, LAMBERTVILLE, N. J.

TEXAS

ARKANSAS AND LOUISIANA.

CHEAP HOMES FOR ALL!

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Will mail on application, free of cost, postage prepaid, books with maps, giving reliable information of Texas, Arkansas, or Western Louisiana. Those meditating a change to a new country, please address
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The simplest machine ever devised for the purpose.

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Address TOTTEN & CO., Pittsburg, Pa.

SEND TO LONDON, BERRY & ORTON PHILA PA FOR THE BEST BAND SAW BLADE

MINERAL WOOL.

This Fireproof and indestructible material successfully prevents loss of heat by radiation, keeps frost from water pipes, deadens sound, checks spread of fire in walls, partitions, floors of dwellings. 25 cts. per cubic foot.
U. S. MINERAL WOOL CO., 16 Cortlandt St., N. Y.

NEW AND CHEAP way of forming ducts in plastic material, of water cements or asphaltum, of any size, of any length, by means of an elastic core, for aqueducts, underground telegraphs, hydraulic rams, air tubes, etc. Rights for sale. W. F. QUINBY, Wilmington, Del.

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Modern American Marine Engines, Boilers, and Screw Propellers:

Their Design and Construction, showing the Present Practice of the most Eminent Engineers and Marine Engine Builders in the United States, among others, Charles W. Copeland, Charles E. Emery, Robert H. Thurston, Thomas Main, Thomas Jackson, George H. Reynolds, William H. Hoffman, H. L. Stellwagen, John Roach & Son, The Wm. Cramp & Sons Ship and Engine Building Co., The Harlan & Hollingsworth Co., The Pusey & Jones Co., H. A. Ramsay & Co., The Atlantic Iron Works, The Morgan Iron Works, The Herreshoff Manufacturing Co., F. C. & A. E. Rowland, Delamater Iron Works, The New York Safety Steam Power Co., The United States Bureau of Steam Engineering, etc. For the Use of Engineers, Draughtsmen, and Engineering Students. By Emory Edwards, M.E., Author of "Catechism of the Marine Steam Engine." Illustrated by 30 Large and Elaborate Plates of the most recent American Marine Engines, Boilers, and Screw Propellers.

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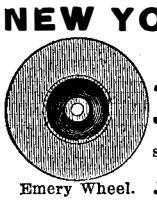

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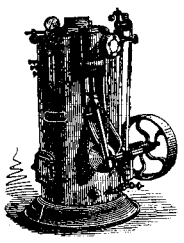

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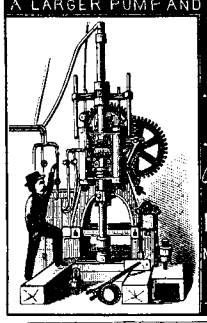

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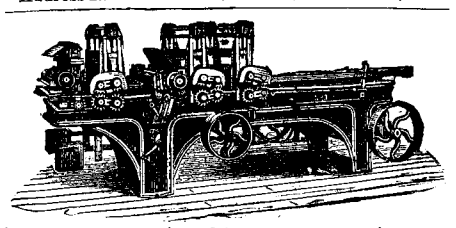

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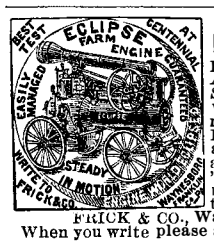

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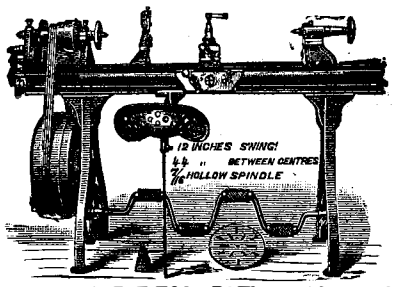

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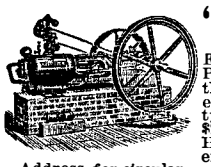

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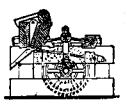

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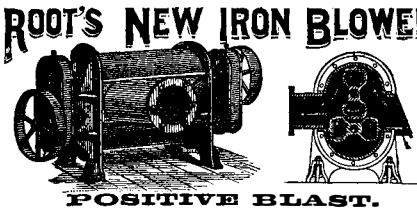

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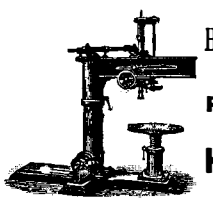

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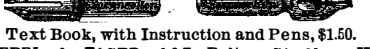

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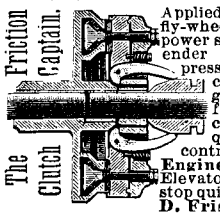

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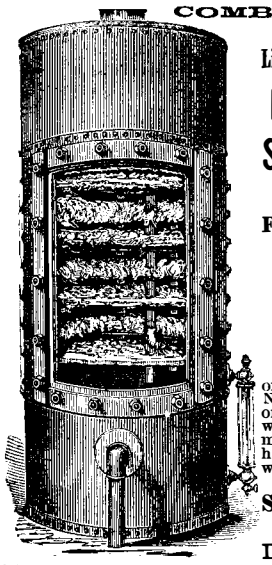

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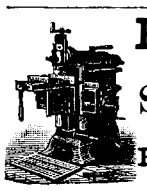

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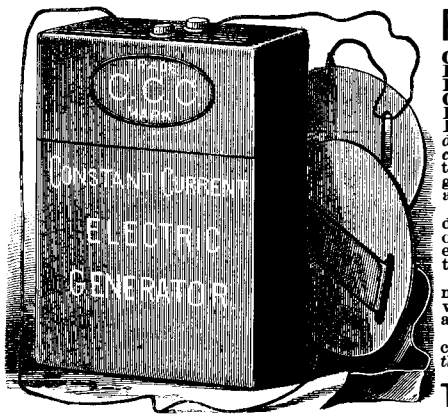

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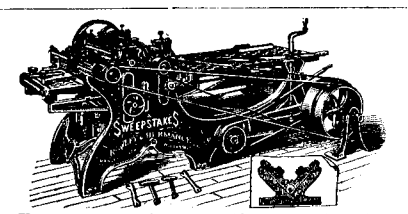

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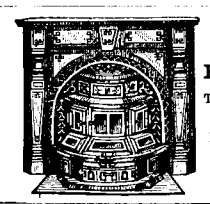

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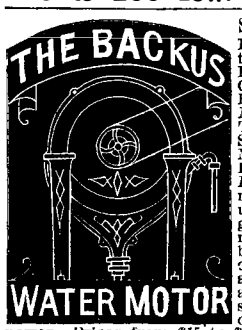

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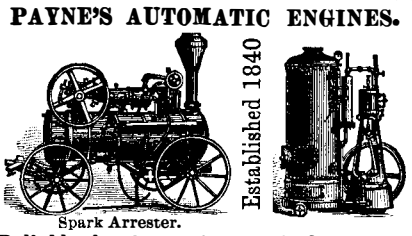

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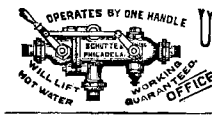

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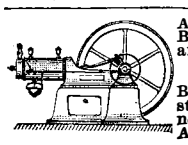

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